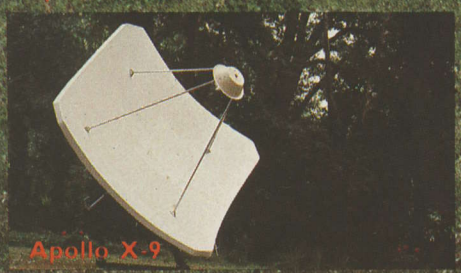
COOP'S SATELLITE DIGEST

AUGUST 1982

We'll pay to find out

Apollo X-10



Apollo X-9

Amplica R-10 Tuner

Microdesign Receiver

Apollo Z-1 Tuner

If your company buys or sells satellite receiving equipment and it's not Apollo™, we'd like to know the reason why.

National Microtech supplies more satellite TV antenna systems than anyone in the world—we've got to have some **good** reasons why! In fact, you're looking at some of the world's best satellite TV equipment on this page.

Our new Apollo Z-1 and our Amplica R-10 both use an LNC instea of the old-fashioned LNA—and both tuners interface to change the polarity electronically (no rotor) and aim the antenna remotely.

The Microdesign receiver has a wireless remote control with memory for channel, polarity, and antenna aiming interface.

The new Apollo X-10 antenna is made of **precision** injected fiberglass panels that are guaranteed to match perfectly. The performance of the Apollo X-10 at 4 and 12 GHz is the best of the 3 meter dishes we've seen in the industry.

Our equipment makes good sense, and our prices are world class. We'll gladly pay for your call to find out the reasons why you're not using National Microtech's equipment...and we'll promise you some good reasons why you should. Call today **TOLL FREE**.

National Microtech, Inc.
P.O. Drawer E/Grenada,MS 38901
In Mississippi 601-226-8432
Toll Free:800-647-6144

While most major sporting events and movies can be received on Apollo systems, National Microtech cannot sell or transfer the viewing rights.

TOP OF THE MONTH

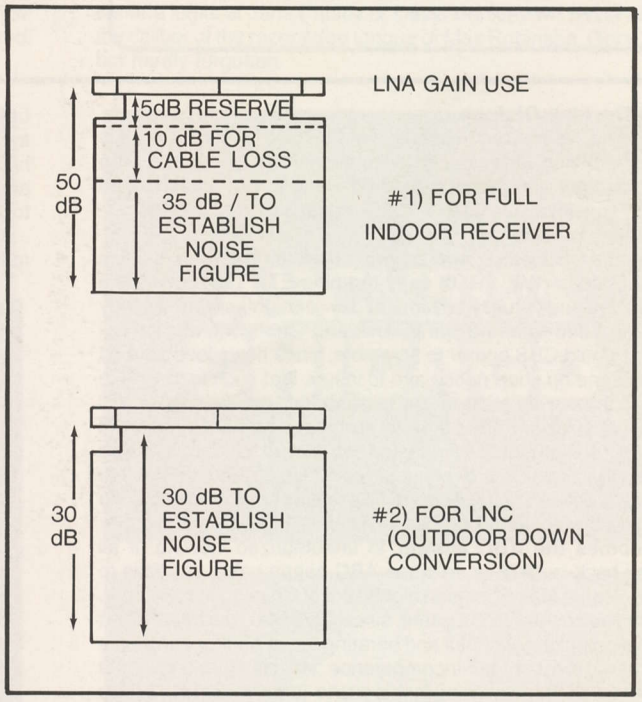
WESTAR 5 may well have a serious impact on the RCA hold (since 1975) on the cable TV business; but any advantage gained by Western Union will be temporary, with new Hughes Galaxy service due in 1983. The first reports of W5 service should be coming in as you read this (having replaced W2 at 123 west) and we'll look at them in the September **CSD.**

VIDEO Processing, one of the last areas in receiver design where innovation can still have an impact on the consumer picture, without adding big dollars to the cost of the home terminal, gets another look this month. Jack Trollman warns receiver tweekers to be sure what they are doing before they tear into a carefully worked out design!

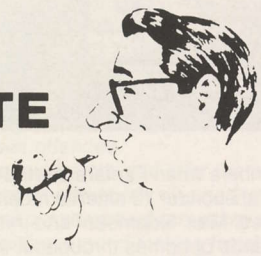
TERRESTRIAL television may be dying. No joke. NBC, CBS, ABC ratings dropped suddenly this past winter, and network news shows were especially hard hit. We figure the networks may now have good reason to run scared, and so we are trotting out a historical look at how all of this started; beginning in this issue. If you really understand what transpired **before** satellites, you will better grasp the monumental evolution now taking place.

SPACE is holding their first trade show this month in Omaha. The emphasis is on training and if you are new to the industry, you should give serious consideration to attending. This will be the first gathering of members and would-be members under the umbrella of an organized trade group and like all industry shows, will prove educational and informative.

AUGUST 1982



COOP'S SATELLITE DIGEST



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COOP'S SATELLITE COMMENT

* QUESTIONABLE 3 METER CLAIMS
* PROVO IN NOVEMBER?
* W4 IN BRASIL (!)

BEWARE/The Ides Of June

June was a very strange month for the give and take battles involving scrambling of private satellite service transmissions. The trend was for more and more obvious efforts to thwart unauthorized viewing of 'sensitive' or 'cash-critical' transmissions, but the exception(s) were notable.

First comes CBS with a new program to scramble various news feed transmissions (W4, TR10, early morning ET). These were the same feeds you see virtually anytime of day (or night) spread as they are over every bird from Intelsat to Anik and Ghorizont, and all between. Why would CBS bother to scramble, since news feeds are by their nature done on short notice and to insure that such feeds get to every possible user location in the best shape, while they are still news, there is seldom if ever time to arrange for the distribution of descrambling equipment. The only logical answer is that CBS was 'testing'. For that analysis is the unusual selection of TR10 on W4; not your normal news feed transponder. Still, the effort was made and one must assume there was a purpose in mind.

Then comes the ABC answer to unauthorized viewing. It all started way back in 1978 or so when ABC began using satellites to feed the venerable Max Robinson nightly out of Chicago to New York. Just in case you are new to the game, since 1978 Max has held the fort in Chicago sipping on his drinks and berating those poor unfortunates who work under him for their incompetence. He sits there for up to a couple of hours per night, waiting for his cue to 'jump in' with a leadin to this or that news story. If you have any doubts about the American news system, and how it turns 'warm up announcers' into images of men with great wisdom, and understanding of the depth of the day's news stories, a few hours spent watching Max should end your doubts.

Now way back in '78 ABC was contracting with RCA to use a feed on F2. This was when the cable industry was still using F2 (for you newcomers, cable started life on F2, moved to F1 in 1979, and then to F3R in late December of 1981). They were slotted on TR16, which at that time was in use by a Houston based regional movie and sports channel service called FANFARE. But, Fanfare didn't start service until early evening CT so ABC by RCA assignment got to use the transponder for the Max Robinson warm up. Max was no less sure of himself then, than now. He was belligerent, abusive to subordinates and quick of temper if somebody moved a pencil or didn't chill his drink to the prescribed temperature.

In that era, cable systems were not as sophisticated as now, and many didn't have any equipment to turn on the satellite feed to their

subscribers when Fanfare started service; they just ran the output of their transponder 16 satellite receiver into a modulator 'full time'. That plugged Max Robinson and his less than dignified antics into thousands of homes throughout the southwest every afternoon.

Well, it was bound to happen. One day a little old lady in a small town in the panhandle of Texas happened to twist her dial and she came upon Max Robinson about an hour ahead of the time when the

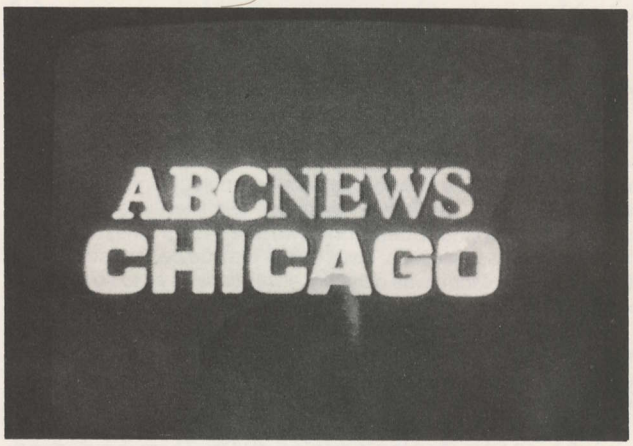
little old lady was accustomed to seeing Max. She sat down to watch. It took her about ten minutes to figure out that "this Max Robinson" was not the same dignified, astute, pleasing man she normally watched. It took her about ten more minutes to get her Congressman on the telephone. She was, it turned out, the mother of a Congressman and she was very upset to hear Max Robinson suggesting to a young (white) girl that she was only fit for sleeping with (color other than white) 'pigs', and telling a (fellow black) makeup person where certain 'acts' could be procured 'by mentioning my name'.

The Congressman and the FCC sorted it all out in short order, and in an unusual rush of paperwork the FCC warned everyone involved that it was the responsibility of the cable firms taking a service (such as Fanfare) to insure that the ONLY service their subscribers actually saw in their homes was the Fanfare service; not any others which might happen to be (shared) on the same transponder. RCA moved Max and crew to another transponder.

Robinson.

Finally, in June, ABC decided to take it a step further. Apparently there were too many of us reading Max's lips. And they began to experiment with dropping both the audio **and** the video between the actual Chicago to New York feeds, replacing the live unedited studio camera look at Max and crew with a piece of artwork that told those who might stumble on by they were seeing a transmission from ABC News in Chicago.

If ABC sticks with this format, so ends the saga of one of the more colorful pieces of early satellite history. There are some great 'out-take' tapes of Max at his best floating about, and they will undoubtedly become collector items on the satellite circuit. It is a pity we may be losing, or already have lost, Max and his antics. Brief off-camera looks at Jane Pauley or David Brinkley will never come up to the caliber of the razor edge tongue of Max Robinson. Gone, perhaps, but hardly forgotten.



Off by themselves on first one and then another Westar, Max and the Chicago crew have been allowed to do pretty much what they want in ensuing years. This was, afterall, a **private** feed from ABC Chicago to ABC New York and anyone that happened across it was obviously trespassing anyhow. But somebody 'upstairs' at ABC was plainly worried about all of this, and in as much as Max is not known to be an easy 'talent' to rationalize with, we can envision a scenario where ABC finally decided that if Max was going to act like Max, no matter how they talked with him, that it was going to be up to ABC to make sure that nobody had their delicate senses offended.

So ABC took to cutting out the audio before and after the actual Robinson feeds; creating employment for somebody who had to sit at an audio control board in Chicago and punch up background music to go with the unpurged video of Max sitting around making facial gestures and generally looking mean. Their reasoning, I am sure, was that only lip readers would continue to be 'offended' by Max if they cut out the audio. This was ABC's first step at 'scrambling' the unpurged Max

If the major commercial networks have slowly become more conscious of their on-satellite non-broadcast segments, a surprising Don King (**THE** great fight promoter) may be coming about the opposite way. Don King surprised many, myself included, by taking his mid-June $50,000,000 Cooney/Holmes fight directly to RCA F4 (TR11) and leaving it unscrambled for not only the prelims but the main bout as well. Perhaps King felt he could afford to be generous.

The take from the fight reportedly was the largest ever. Certainly it was a bunch of money and King is onto a new promotion scheme involving 'licensing' cable TV systems to carry future fights and entertainment specials. He plans to have a fight every month (next was July 21st) and to augment that with show biz specials. He also plans to use the satellite to feed his sports and entertainment specials to cable systems which are **licensed** to carry the feeds. Certainly one way to capture the **attention** of the cable industry is to throw the events up on

(CONTINUED / page 40)

EVALUATING TVRO VIDEO PROCESSING

I read with interest the April issue of **CSD** where a modification to a workhorse video bandpass filter was proposed.

For those unfamiliar with the context of the article, the filter in question first appeared in Tay Howard's original receiver design and has subsequently, as was mentioned, been used in many receivers in its original form. Since Microelectronics Technology Corp. (2446 Watson Ct., Palo Alto, Ca. 94303) produces this filter together with its companion de-emphasis network known as 2U15T04 and I consult for them on TVRO applications, I was aware that the performance of the filter in its original form was optimum. I was curious as to how it could be improved substantially.

Using an HP 8507B Network Analyzer and a filter made of parts carefully selected to have the specified values, I swept both the original and the modified designs and came up with the results described below.

The response of the original design is pictured in **Figure 1.** The X axis is 0 to 10 MHz. And the Y axis is 5 dB/Div. There is a diamond-shaped marker at 4.2 MHz (the upper limit of the NTSC video spectrum). Since the analyzer does not start operating until it reaches 500 KHz, there is a small gap in the trace near the left end of the passband.

In order to make the response across the passband more visible, the Y axis was changed to 2 dB/Div. This can be seen in **Figure 2.**

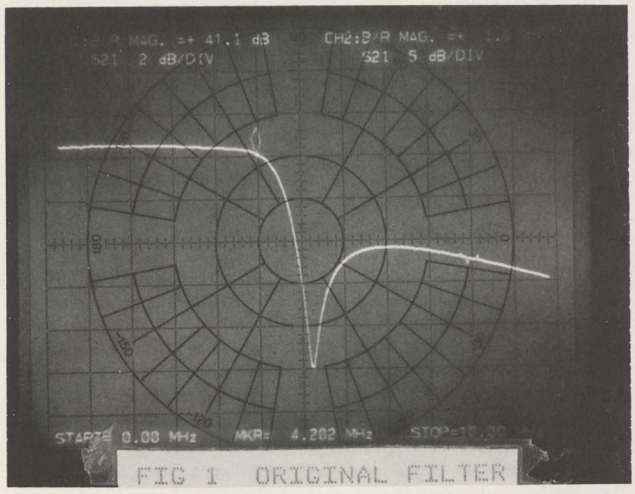


FIG 1 ORIGINAL FILTER

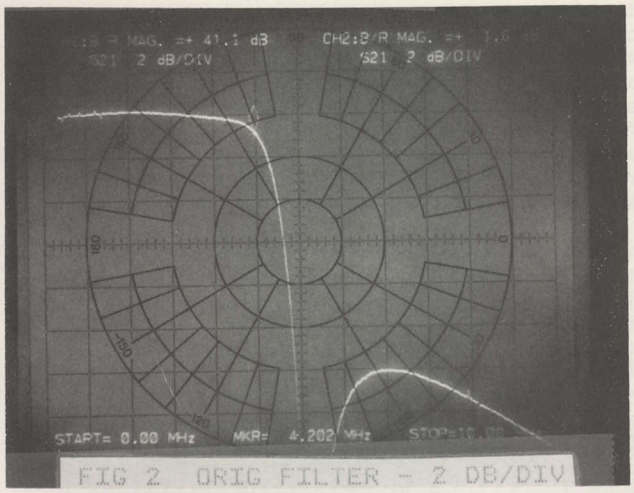


FIG 2 ORIG FILTER - 2 DB/DIV

Note the passband is flat to within a 0.5 dB out to 4 MHz then starts to roll off rapidly. At 4.2 MHz, we can see the response is only down by slightly less than 1 dB from midband while attenuation of unwanted audio subcarriers in the 6.2 and 6.8 MHz range is approximately 12 dB.

Next we installed the 10 ohm resistor and the 2.7 microhenry inductor as suggested by the article and the result is as shown in **Figure 3.** Here the vertical scale was again 2 dB per Cm. and we find that the high-frequency end is indeed emphasized slightly, peaking broadly at around 3 MHz but less than 1 dB above the response at 500 KHz. More significantly we see that the rejection of audio subcarrier signals above 5.5 MHz has been reduced to roughly 8 dB contrary to Figure 1 of the article where the rejection of the revised filter is claimed to be approximately 6 dB BETTER at these frequencies.

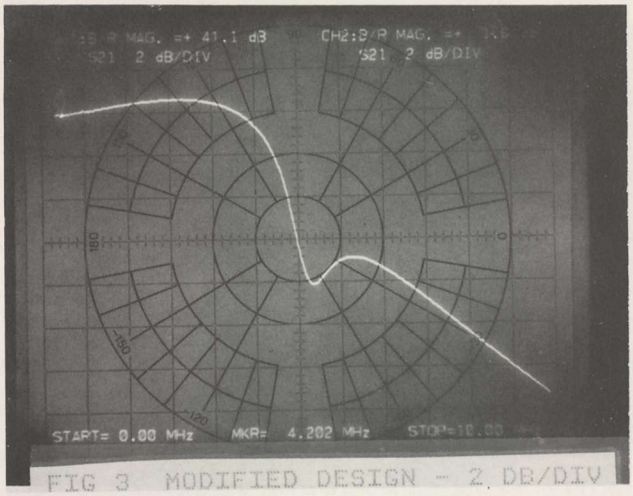


FIG 3 MODIFIED DESIGN - 2 DB/DIV

In **Figure 4** the two responses are shown simultaneously using the 2 dB/Div. vertical scale. Here the marker is again set at 4.2 MHz. It can be seen that the original filter rolls off very slowly and is down perhaps 0.2 dB at 3.6 MHz. The modified design however shows only about 0.8 dB higher output at this frequency with nearly coincident response at 4.2 MHz.

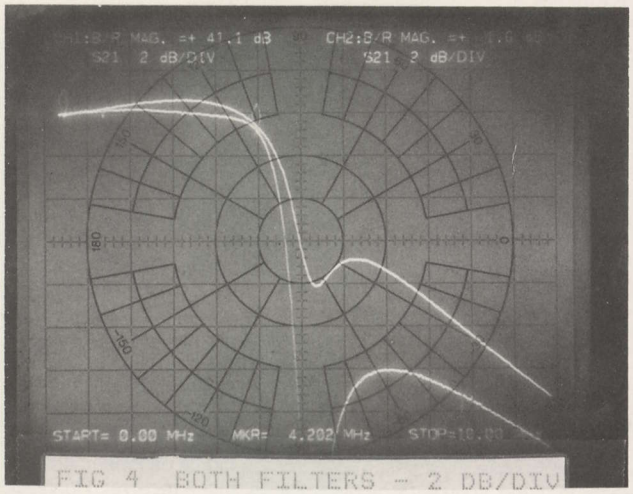
CONCLUSIONS

1. There is some tendency to favor the high-frequency video components by the modified design but by less than 1 dB. A more effective means of achieving high-frequency peaking is described below.

2. Rejection of audio subcarrier components by the revised filter is about 4 dB poorer than the original design. This potentially has a much more serious impact on video quality than might appear at first

AN ANALYSIS OF THE BARKER MODIFICATION TO THE VIDEO PASS FILTER
by
Jack Trollman
Consulting Engineer
Microelectronics Technology Corp.
2446 Watson Court
Palo Alto, Calif. 94303

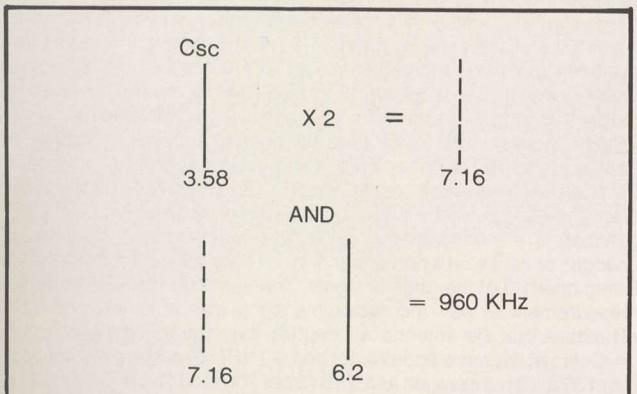
glance and is reason enough to retain the original filter design. Audio subcarriers should be attenuated significantly before being allowed to enter the video (picture) circuitry.



WHY TAKE OUT THE SUBCARRIERS? YOU CAN'T "SEE" THEM.

There is good reason to keep the audio subcarriers out of the video channel even though they appear to be "invisible" to the eye. The problem comes about if there exist non-linearities in the video amplifier chain between the demodulator (PLL/Discriminator) and the CRT. If these exist, third order intermodulation products can be generated that will fall into the video spectrum causing crosshatching, "sound bars" or a graininess in the picture.

For example the second harmonic of the chrominance carrier (2x3.58 MHz) can mix with 6.2 or 6.8 MHz audio carriers producing visible video-band products at 2x3.58-6.2 = **960 KHz** and 2x3.58-6.8 = **360 KHz.** Other audio carriers will produce similar responses.



INTERMODULATION PRODUCTS

Another potential source of intermod products occurs if the audio carriers are allowed to reach a modulator. In inexpensive modulators there is no attempt to band-limit the video (low-pass filter) to prevent frequencies above 4.2 MHz from modulating the TV channel RF carrier. This means that if the audio subcarrier is not effectively filtered out in the receiver, it could also modulate the TV channel carrier along with the video. This can beat with the 4.5 MHz sound carrier oscillator also generating a response within the video passband. For example 6.2-4.5 = 1.7 MHz.

The original low-pass filter design is very effective in reducing audio subcarrier levels in the video to insignificance. In view of the intermod potential, changing this filter to achieve chroma emphasis is not the best approach.

HOW CAN I TELL IF MY RECEIVER HAS A PROBLEM?

If your receiver is producing a "washed-out" color picture or you suspect it has video high-frequency rolloff, find yourself a good wide-band scope (10 MHz vertical response minimum) and look at the Multiburst Vertical Interval Test Signal. This is available on several F3R sources such as WGN, WTBS, USA Network among others and typically appears on Kine 17 of Field 1. It should look similar to **Figure 6.** All six frequencies are (or shold be) transmitted at the same amplitude as shown. If your receiver is operating properly you should see this same waveform at your video output. Actually it's a good idea to look at this signal as transmitted by a number of different sources to be certain the source is not faulty.

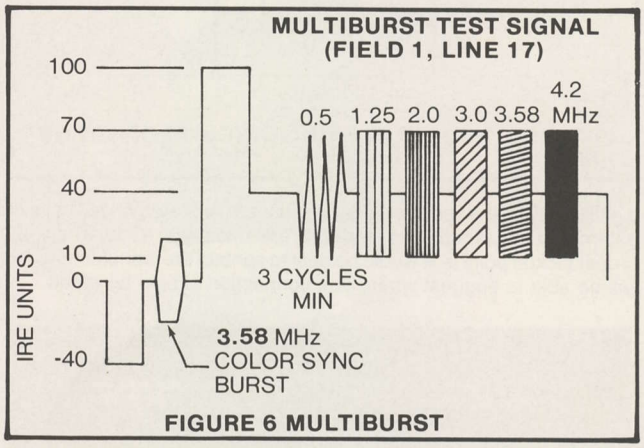


FIGURE 6 MULTIBURST

High-frequency rolloff will show up in the waveform similar to **Figure 7.**

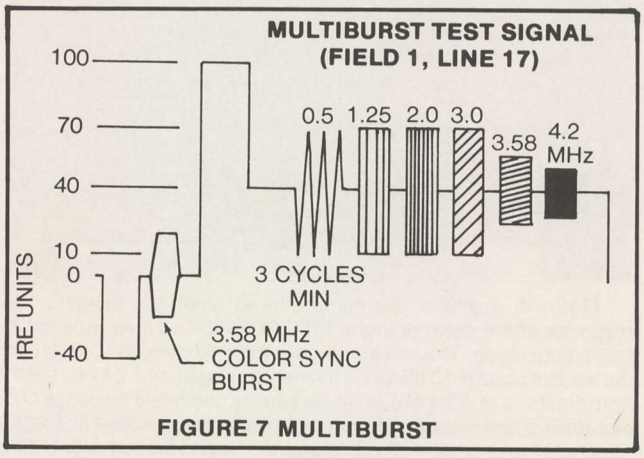


FIGURE 7 MULTIBURST

For those utilizing the 592 Video Amplifier as described in the Howard design or similar circuit, a simple high-frequency peaking circuit can be installed without altering the low-pass filter. This is shown in **Figure 8.**

Install the series 5K pot and 82 Pf combination in parallel with the Video Gain control. Watch the multi-burst display and adjust the pot for equal amplitude on all six frequencies. It may be necessary to increase the capacitor value if higher levels of compensation are required.

RELATED OBSERVATIONS

External audio processors should be connected directly to the PLL/Discriminator output ahead of all de emphasis/filter networks. If you are operating an audio processor from the video output you may be noticing noisy or garbled audio depending on the frequency. Since the de emphasis/lowpass filter is between this output and the PLL/Discriminator, the audio subcarriers amplitudes have been reduced

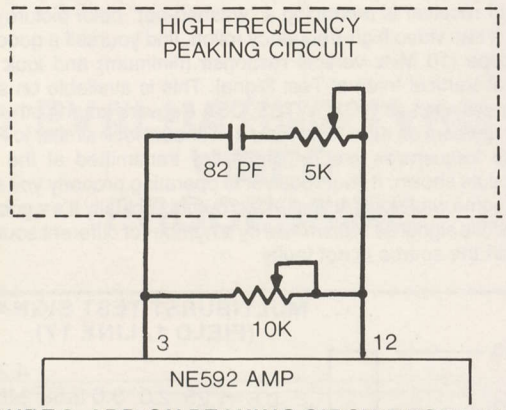


FIGURE 8. ADD-ON PEAKING CIRCUIT FOR 592 OP AMP.

significantly. If the receiver has no output designated specifically for external audio processors and you are uncertain as to where the proper pickoff point is, it would be best to contact the manufacturer. He will be able to suggest where this connection should be made.

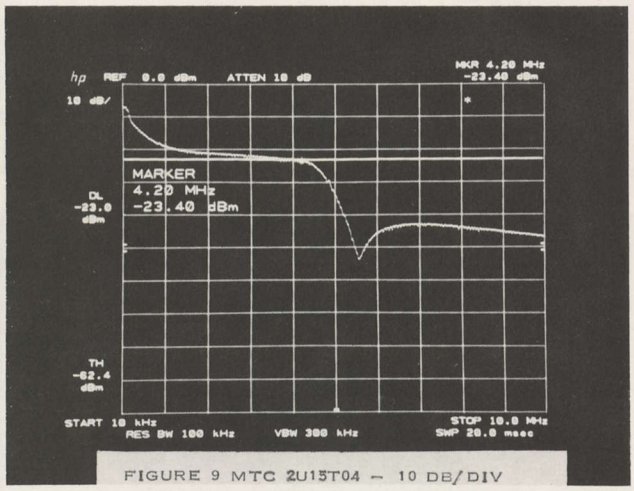


FIGURE 9 MTC 2U15T04 – 10 DB/DIV

Figure 9 illustrates the composite de emphasis/low-pass filter response of the network in the MTC 2U15T04 module as wired for 525/60 operation. The sweep range is from 10 KHz to 10 MHz. and the vertical scale is 10 dB/Div. The marker is again at 4.2 MHz. (on the horizontal line at -23.4 dB). Here we see the combined response of de emphasis plus low-pass filtering. Audio subcarriers above 5 MHz are attenuated in excess of 20 dB below the visual video spectrum by the composite de emphasis/low-pass filter action.

THE LNA STORY

Of the three essential parts for a typical TVRO terminal, the LNA has seen the most dramatic changes in performance and pricing since the first cable systems in Mississippi and Florida joined the HBO 'satellite network' back on September 30, 1975; thereby putting the present revolution into gear.

LNA. What is it, and why is it so important? LNA is short hand for **L**ow **N**oise **A**mplifier. If you remember the early days of terrestrial television, you may reall a gadget that stuck first at the antenna, and then on the antenna, called a 'signal booster.' The antenna mounting signal booster was (and still is since many are still sold) the pre-space-age equivalent of today's LNA.

Anytime we have a weak signal coming to an antenna, and the frequency of the signal is in the VHF (very high frequency) region, **or above** (above means higher in frequency), there is a concern that the

COOP ON TVRO BASICS (The LNA)

weak signal get amplified, as soon as possible, before it begins to travel down the transmission cable to the attached receiver (demodulator). **All transmissions lines lose signal.** Transmission lines are like pipes in water systems; they carry the signal as pipes carry the water, from the 'source' (the antenna feed) to the receiver. However, there is one significant difference between coaxial cable and the water pipe analogy. Coaxial cable has 'loss'; that is, some portion of the signal that you put 'in' never gets to the 'out' (end). This is caused by the 'resistance' of the cable; a function of cable diameter (size) and design. Smaller cable always has higher losses than larger cable, if the two cables being compared are of equivalent design. Cable loss comes from 'friction,' or resistance. Cables that carry radio frequency (RF) signals are designed to have as low resistance as possible; copper, for example, coats the surface of the signal carrying portion of the wires. Copper has a lower 'resistance' to the flow of RF than does steel, or aluminum.

Any length of cable has loss; even one inch. And, more important than length, is the frequency of the signal. The higher the frequency of the signal, the greater the loss or equivalent resistance of the cable to the flow of RF. The exceedingly high frequency (SHF for super high frequency) microwave signals have very high losses in cable. One of the ways to measure loss is to determine the power available from the antenna (feed, in a TVRO), and then measure how much of that power (whatever the original amount may have been) reaches the opposite end. If, for example, a length of cable has "3 dB of loss" between the input and the output, and the cable length happens to be 100 feet, then the cable manufacturer will tell you that **at that certain frequency** "cable loss is 3 dB." If you don't know a dB from a tuna sandwich, that may not mean much to you. The dB (decibel) is a measurement tool. It is a log 'function'; meaning, it changes or varies on a non-linear curve. Three dB is the equivalent to losing one-half of the original signal. The same dB works in antenna measurement as well. Increasing the signal gain of an antenna by 3 dB means that the antenna will capture twice as much signal.

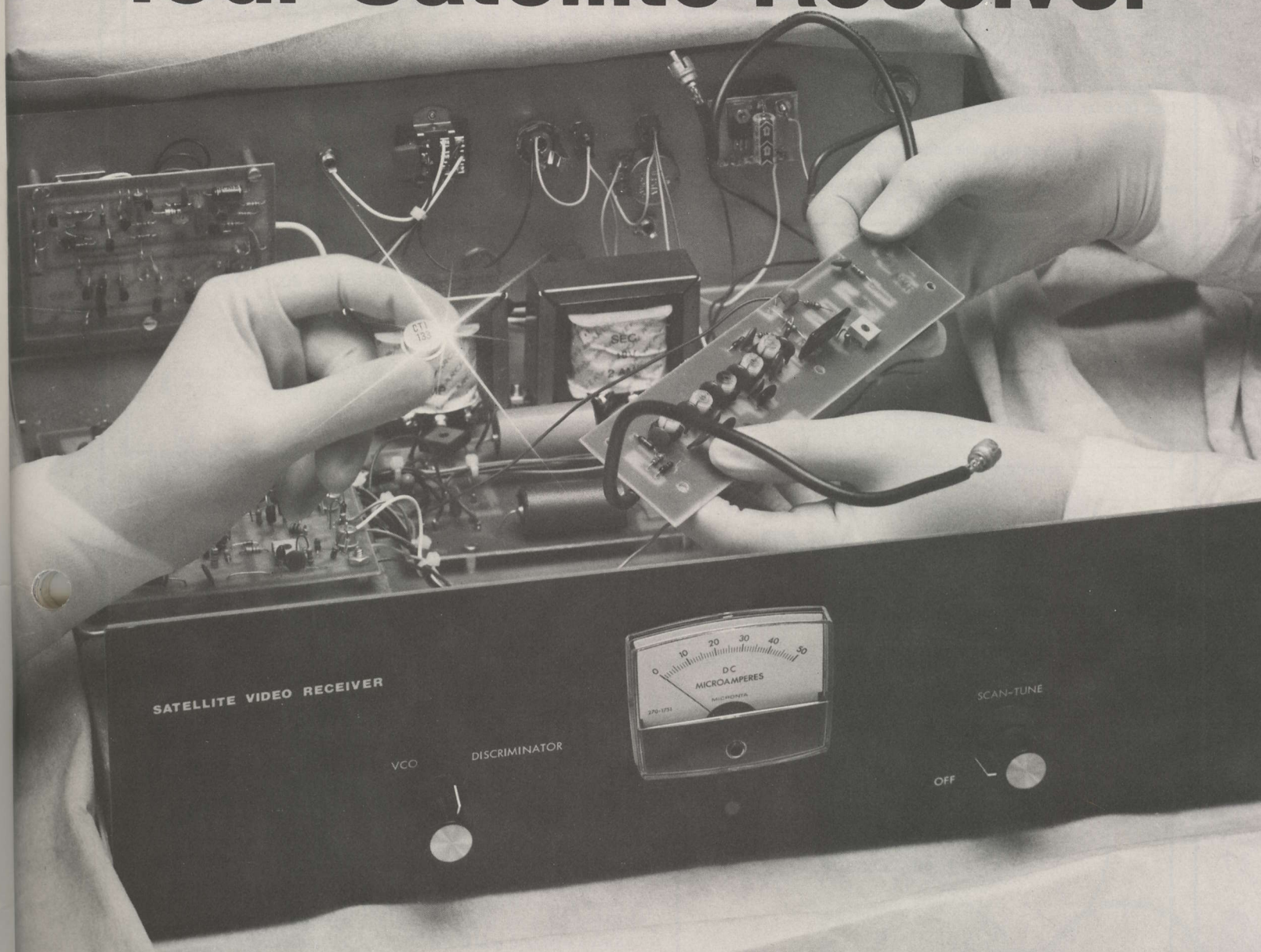
Some of the more popular (for home TVRO's) cable loses not 3dB (per 100 feet) but as much as 25 dB (!) per 100 feet. Ouch. That's really a double ouch since we are a log function. How's that? Well, if you have 3 dB of cable loss between the input and the output, you'll end up with one half the satellite signal at the output as you started with at the input. But if you have 6 dB of cable loss, now you will end up with 1/4th the original signal. A cable with 20 dB of loss? Well, it works out this way:

3 dB loss = 1/2 signal left
6 dB loss = 1/4th signal left
9 dB loss = 1/8th signal left
12 dB loss = 1/16th signal left
15 dB loss = 1/32nd signal left
18 dB loss = 1/64th signal left
20 dB loss = 1/107th signal left

That is, and should (sound) pretty frightening!

The same type of numbers apply to **all** transmission lines,and the only real variable is the **frequency** of the signal(s) being carried by the cable. The higher the frequency, the greater the loss. And cable

Put More Life Into Your Satellite Receiver



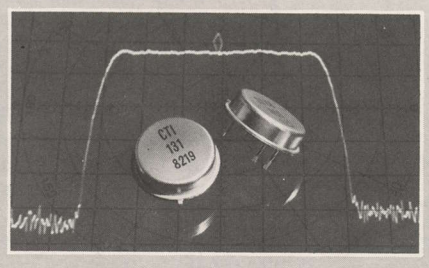
. . . and End Costly Filter Tuning with CTI's Compact SAW Filters

Now, any satellite receiver's reception can be greatly improved with a single operation – designing-out the bulky LC filter and replacing with a Crystal Technology SAW filter.

By designing-in our solid-state SAW filters, your next satellite receiver will reject unwanted signals by 40dB or more. Group delay variations of ±10 nanoseconds will be typical. And the built-in fixed interdigital transducer means no time-consuming, error-prone tuning will be required. What's more, CTI's SAW filters will simplify assembly in both commercial and home TVRO receivers.

Our new maintenance-free SAW filter line includes 70MHz filters with bandwidths from 16MHz to 36MHz and UHF filters at 590MHz, 610MHz and 880MHz.

All are PC-board compatible and do not require external shielding. They're totally self-contained in small metal TO-8 packages about the diameter of a penny.



It all adds up to better reliability, cost efficiency and optimum signal reception.

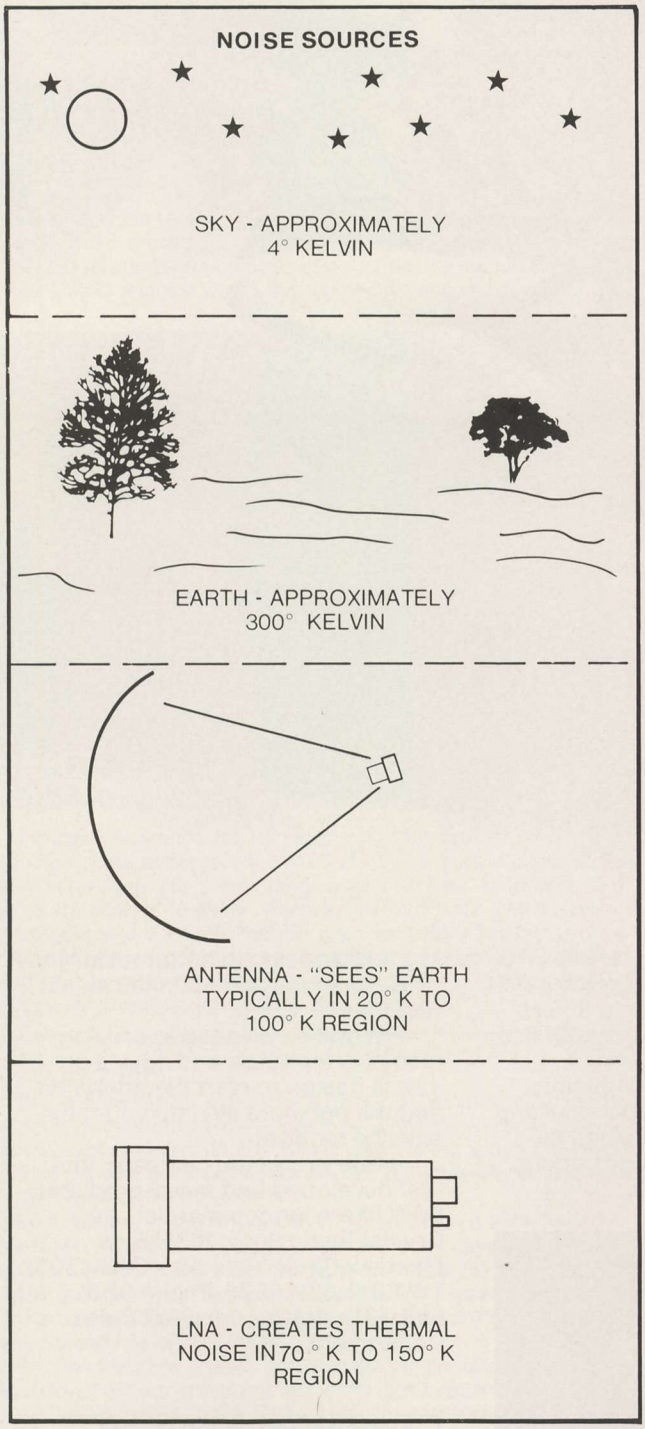
We will be pleased to provide technical literature and advice on circuit design to start the operation that will put more life into your next satellite receiver.

Write or call the company that first developed and mass-produced SAW filters for commercial use: Crystal Technology, 1035 East Meadow Circle, Palo Alto, CA 94303, TWX 910-379-6625, Phone (415) 856-7911. Ask for our SAW Sales Department.

Crystal Technology
A Member of the Seimens Group

suppliers rate their cable losses, on a chart, which usually shows cable loss up and down along the vertical edge, and frequency left to right along the horizontal edge. The line slopes; less loss on the left hand (lower frequency edge); more loss at the higher frequency edge. Not all cable, in use for TVRO installations, is **rated** by the manufacturer at the 4 GHz frequency band. That ought to tell you something; namely, that if the manufacturer **stops** his 'chart' at 3,000 MHz (3 GHz), for example, that he does not believe the cable is useful at 4 GHz.

All of this leads us up to the rationale behind today's version of the LNA. The LNA needs to amplify the (very) weak TVRO signals as quickly as possible, in the chain of the system. Some very early systems installed the LNA in a position where cable had to run from the feed antenna to the LNA input. That cable, no matter how good, had loss and that loss, if it occurs before the LNA, is 'loss' forever. There is no way to get signal loss that occurs before the LNA back. There **is** a way to get signal loss **after** the LNA, back into the system. We'll see what this means shortly.



1975/6 LNA CHOICES

COOLED PARAMETRIC AMP	NOISE TEMP - DOWN TO 15°K COST - UP TO $75,000
UNCOOLED PARAMETRIC AMP	NOISE TEMP - 100° to 200°K COST - UP TO $20,000
EARLY GaAs FET AMP	NOISE TEMP - 200° TO 220°K COST - UP TO $7,500
BI-POLAR TRANSISTOR AMP	NOISE TEMP - 300° TO 400°K COST - UP TO $3,000

The first LNAs had two specifications of interest. One was their noise figure, and the other was their gain. **Noise figure?** Well, while signal gain sounds like it might be a pretty important feature, there is an even more important feature; noise figure, or as we have come to call it in the TVRO world, noise temperature. The two can be interchanged, as terminology, for our purposes here.

Noise temperature/figure is a qualitative measurement. The dB is a 'relative' term, since it says that the gain or loss, in decibels, will not be a hard signal voltage gain or loss; rather it will be a percentage or function of what we began with. Remember, 3 dB of loss is the equivalent to losing one half of the signal; and 3 dB of additional gain is the equivalent to adding or doubling the signal to twice its original value.

Noise temperature has always been a **rigid** specification. It tells us, when we know the number, **how much noise** the amplifier circuit contributes to the signal we are trying to amplify. **Noise?** Well, there is noise all around us. The earth below you is a source of noise. At our 4 GHz band, if you turned an LNA plus feedhorn directly down towards the bare ground, you would 'see' a noise source equal to approximately 300 degrees Kelvin. The trees have noise. And noise, in case you missed the point, is 'anti-matter' for TVRO installations. **Noise,** in one form or another, **causes sparklies.** And poor audio.

Now back in the 1975 era, the only market for LNAs were the Intelsat people and a handful of commercial terminals associated with ANIK, Westar and Satcom. There were no private terminals, and by volume if the whole satellite universe jumped ahead by ten new terminal installations in a single month, that was considered big time stuff. And since most installations, even the commercial ones, only require a couple of LNAs, there was not much of a market for LNAs. The few that were built were literally hand built, and the technology for LNAs was straight out of Intelsat.

All Intelsat installations use LNAs. But they are not the type of LNAs we are acquainted with. They are something called "parametric amplifiers," a very complex piece of electronics built with jewelry like precision. And, costing in 1975, upwards of $50,000 per piece. A parametric amplifier is a low noise amplifier (noise temperatures as low as 15 degrees Kelvin are possible) of a very special breed. It uses electronic black magic to generate a microwave signal four or more times higher in frequency than the intended receive signal, and then it

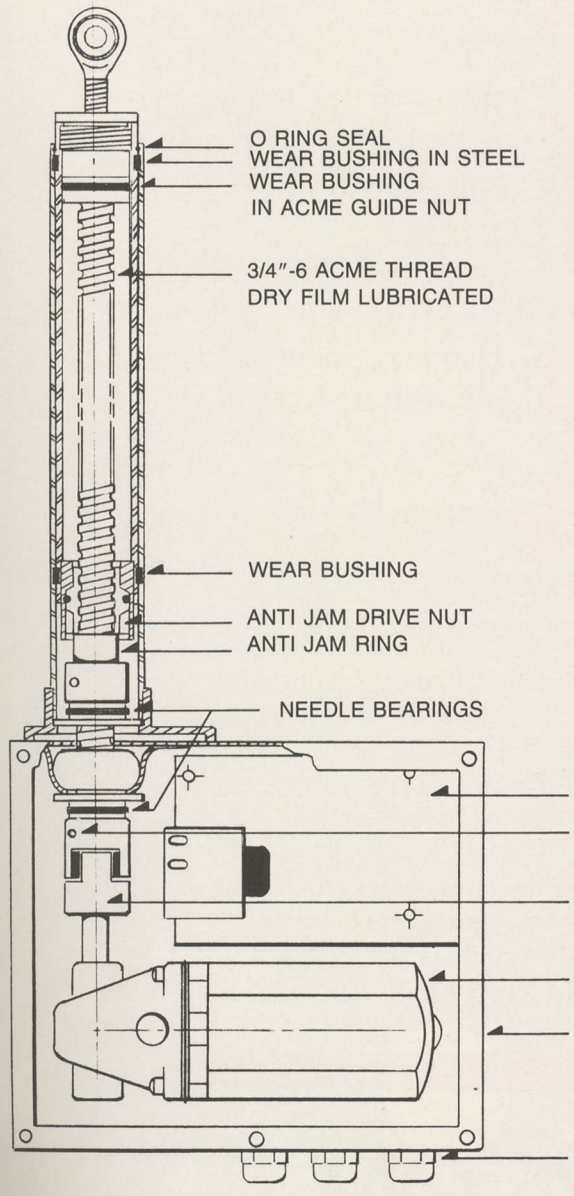
designed(di zind'),adj.made or done by design; intended; planned.

Very simply stated, the (actuator) was (designed)...from the ground up...to be a linear drive system for (Satellite Earth Station) antennas.

It was not (designed) to be a garden tractor blade lifter, or a door opener, or a steering gear.

We believe this is most important...because it gives you, the consumer(value engineering)-that's important because your investment in an earth station is sizeable.-Your components should be (reliable) and (effective).

The equipment should suit your application best-not someone else's.
(Would you use your LNA rotor to turn chicken on your barbeque?)



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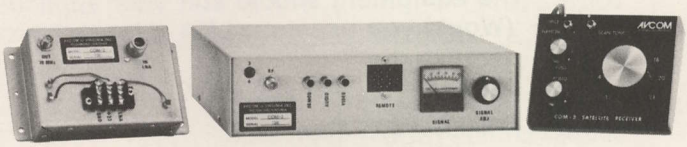

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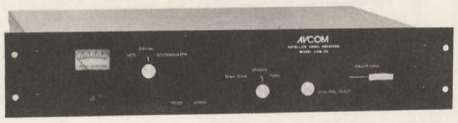

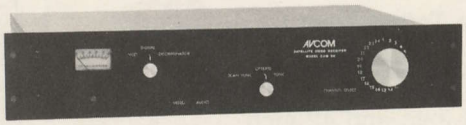

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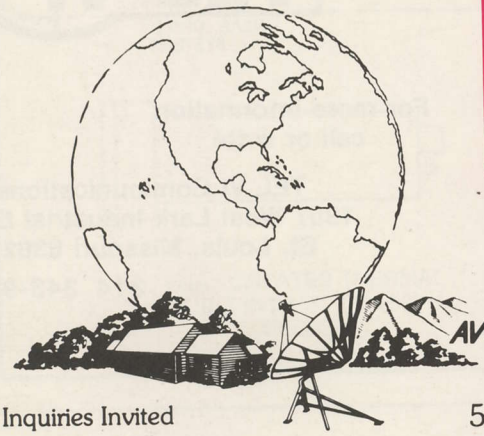

People Are Asking . . .

LNC vs. LNA/Downconverter?

1. The separate downconverter allows use of any noise temperature and brand LNA, resulting in easy system upgrade and repairs.
2. With an LNA/Downconverter, additional receivers can be added for system expansion.
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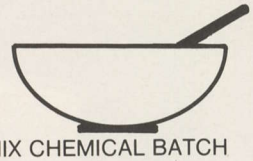
'marries' the internally generated super-super high frequency signal with the received signal through a system employing an electronic 'pump.' There are two types of parametric amplifiers; those that operate in the normal air temperature ('ambient'), and, those that operate in a cooled environment. The cooled ones work best.

The first cable installations went ahead with their 10 and 11 meter dish antennas from firms such as Scientific Atlanta or Andrews (the dishes in that period priced out near $55,000), and their Intelsat grade (Microdyne or SA or Terracom) receivers; and an LNA. A few went ahead and purchased uncooled parametric amplifiers, and for their $20,000 or so (the cooled ones were **more** expensive) they got noise figures in the 100 or so degree range. At the same time the first cable installations were going in, and spending $100,000 up per installation, there was a new technology evolving. It was based upon something called Gallium Arsenide; a synthetic material created by chemists in laboratories. It was known that Gallium Arsenide did, in 1975-6 or so, have the capability of being used in a special type of transistor called a 'field effect transistor,' and when you used it in a field effect transistor you then had a device known as a Gallium Arsenide Field Effect Transistor. Nobody liked the long name, so shortly it was called **GaAs-FET** with the funny mixture of large and small letters signifying the chemical properties of the material in the transistor.

The advantage to GaAs-FETs was that they had the promise of being very low noise amplifying devices. **Without being externally cooled.** The disadvantage of the new device was the fewer than a half dozen people in two firms worldwide knew how to **make** the Gallium Arsenide material which went into the transistors. A further disadvantage, as late as 1978, was that even those who knew how to make the material frequently had trouble duplicating from one 'batch' to the next 'batch' the precise mixture that produced high quality Gallium Arsenide.

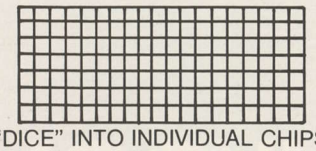
The first GaAs-FETs were a Japanese product. And as recently as 1978, in a very good month, no more than 300 of the GaAs-FETs left Japan and arrived in the United States. Those that did arrive here were expensive; upwards of $300 each! And it took at least two of them, in an LNA, to make an LNA work.

1978 GaAs FET LNA PRODUCTION / PART ONE

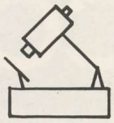


MIX CHEMICAL BATCH

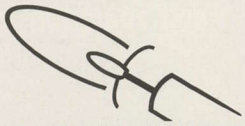
"BAKE" IN OVEN TO "CRISP WAFER"



"DICE" INTO INDIVIDUAL CHIPS



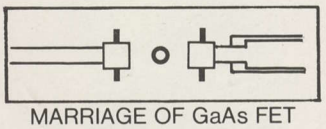
PRELIMINARY GRADING (VISUAL)



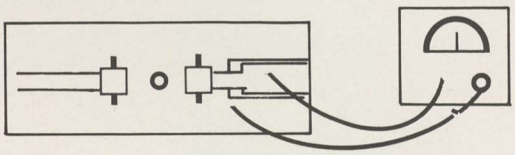
BONDING OF LEAD WIRES, ENCAPACSULATION OF CHIP

1978 GaAs FET LNA PRODUCTION / PART TWO

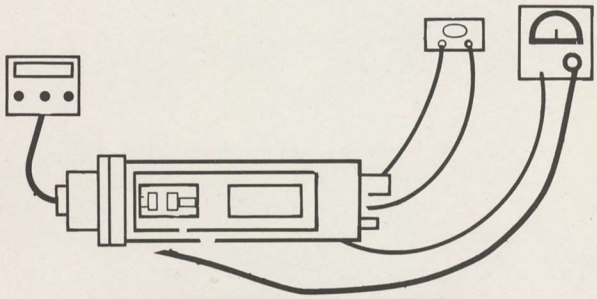
SECONDARY GRADING



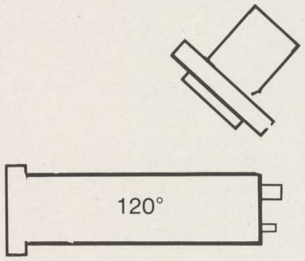
MARRIAGE OF GaAs FET TO LNA FIRST-STAGES CIRCUIT BOARD.



CHECK OF CIRCUIT BOARD



NOISE FIGURE ADJUSTMENT AND LNA QUALIFICATION FOR GAIN, NOISE SPEC



FINAL MODEL SPEC, BASED ON NOISE TEMPERATURE

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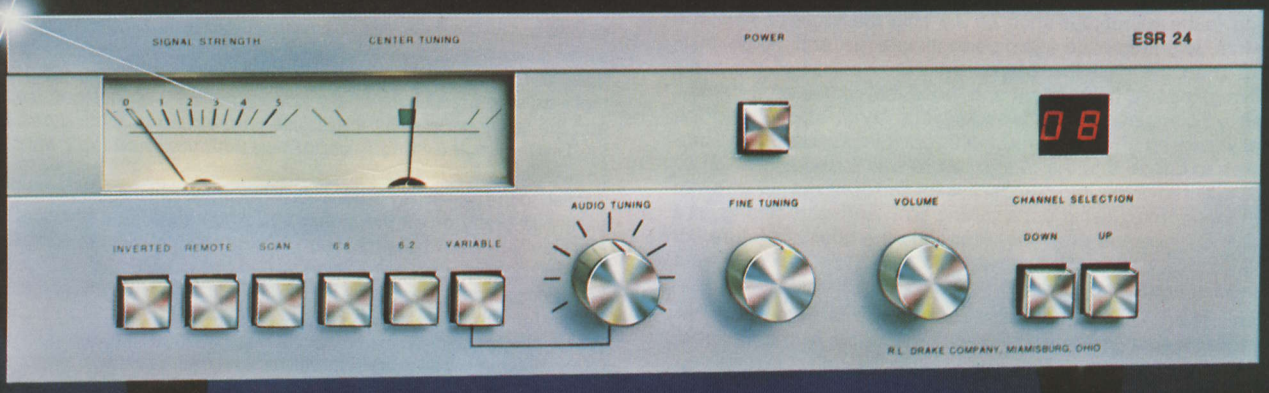

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The first non-parametric low noise amplifiers, built using GaAs-FETs, were in the 280 degree Kelvin noise temperature region, when they reached the US cable TV marketplace. They cost typically $5000 or so each. In 1977, fewer than 200 per month of the basic GaAs-FETs were being produced, and shipped into the USA, and with a pair of devices in each LNA, that said that there were **no more than 100 complete LNAs possible in any single month.** So in addition to being expensive, they were in very short supply. The price aside, there could not have been a home TVRO industry in 1977 or 1978 because the LNA devices to support the industry simply did not exist.

When you bought an LNA in 1978, you stood in line with a number, waiting for your turn to take delivery. Then you rushed to open the carton to see how the **particular LNA** you received 'measured up.' If it was rated as a 220 degree device, you were a very proud cable operator.

By the end of 1978, several things happened to LNAs. First of all, the bottleneck in GaAs-FETs was broken when several firms (including a few in the **USA**) figured out how to make the chemistry work. GaAs-FETs are made in ultra clean rooms and they start off as super-carefully prepared Gallium and Arsenide mixtures spread (literally, but still carefully) on a cookie-like sheet. The raw material is placed into an 'oven' like device where the mixture is 'baked.' It is the combination of just the proper balance of raw materials, just the right 'thickness' of the material on the 'cookie sheet' and just the right amount of 'baking time' that produces the large 'wafers.' After baking, the wafers are removed from the oven and eventually they are cut or 'diced' up into tiny (microscopic) equal sections. These small pieces are so tiny that workers handling them work with special tweezers and spend the day peering at the diced sections through large magnifying lens.

In 1978 and 1979, the waferized tiny pieces were then run through a very elementary type of electronic ('go' and 'no-go') test, and passed on to another crew that spent the day peering through microscopes to assemble the tiny wafer pieces into transistors. This involved encasing (or encapsulating) the tiny piece of GaAs into a miniature housing, 'bonding' to the appropriate spots on the 'chip' the necessary metallic lead wires, and then once again performing a 'go' and 'no-go' test.

And then the real fun began. At this point, all of the really defective chips had been found and those that remained were now married to a container with leads sticking out. About ten percent of the original waferized chips survived to this point in production; the process was so critical that the rate of failure was exceedingly high.

And to put all of this into perspective for time, one did not walk into work in the morning, whip out a mixing bowl and start stirring up a 'batter' of Gallium and Arsenide. Preparing the original mixture, for 'baking,' was a ten day to two week process. The 'batches' were measured in grams, not ounces or pounds.

On many occasions the whole mixture was bad; something that was not discovered until after the mixture had gone all the way past baking and was now diced. That meant, since the dollars invested up to that point was high, that not only were the dollars lost, but the time required to get to that point (perhaps two weeks) was lost. It had to happen; one month, in 1977, both of the plants in the world ('Chemistry Labs' would be a more apt name than 'plant') that knew the 'recipe' for GaAs FETs had bad months. And NO GaAs-FETs arrived in the USA the following month. That meant that nobody got any new LNAs yet the following (third) month, and in that month no new cable TVRO installations went in.

With the GaAs-FETs now looking like tiny-tiny transistors (i.e. in a case and with leads sticking out), the real test was ahead. Keep in mind fewer than 10% made it this far.

Electronic engineers, capable of taking the new GaAs-FET transistor devices and creating low noise amplifiers, were few and far between. Probably fewer than a dozen, worldwide. Each was facing the same problem, however. They had attempted to build GaAs-FET 'test jigs'; special testing chambers designed so the miniature lead wires of the GaAs-FET could be connected to a test system, and the individual GaAs-FET transistors 'checked' for performance. You see, no two worked alike!

There were two solid reasons for wanting to 'pre-test' the GaAs-FETs before they got into the LNA production section:

1) If you had to wait until after the GaAs-FET was installed into a completed LNA to 'test' the GaAs-FET (and the whole LNA), you ran the risk that the individual GaAs-FET(s) selected by random choice for that particular LNA were going to be sub-standard. Yet you were not finding this out until 99% of the labor and 100% of the materials going into the product were expended. It was not a desirable situation at all!
2) If you could 'match' GaAs-FETs of similar characteristics, together, into the 'pair' required for each LNA, you could improve the chances for a good performing LNA. Without 'matching' you were taking part in a giant, big buck GaAs-FET crap shoot.

With each LNA supplier (SCI, Avantek, Amplica were early in the game in the USA) having only a handful of GaAs-FETs to work with per month, they could not afford to 'lose' any. But for all of 1977, 1978 and on into 1979, this is precisely what happened. The LNAs were assembled and tested. One would have a 120 degree noise temperature, and the next one would be 220 degrees. Both had exactly the same number of dollars and cents and hours in them to that point. Yet the 120 was obviously worth more in the marketplace than the 220. So the final grading, or noise figure testing, became the point where model numbers (diffferent numbers for different noise temperatures) were assigned.

By late in 1978, another thing was happening. Every now and again, out of perhaps a couple of hundred LNAs being produced, here would come a unit that was extra-ordinary. That meant a noise figure or temperature in the 75 to 90 degree region. Most of those ended up at RCA or Western Union sites, at $7500 or so apiece. SCI once spent four months waiting for four such units to 'come up' out of their normal production run, to fill an order for an RCA system.

If you got a 'hot one' every now and again, there was obviously some special chemistry involved. Now, if you could only figure out **what** that chemistry was, and turn **that formula** into the formula for **every GaAs-FET** and LNA being produced; you would have the world by the tail.

During 1979, this is exactly what happened. The really good ones were held back from shipment, and with the ever improving technology and analysis equipment, they were disassembled back to the raw wafer diced chip to see what parameters had gone into that unit to make it work so well. From that 1979 research came the ground work that lead to today's LNAs where 120 degrees is the worst case unit(s) and the really good ones are . . . still around 75 to 80 degrees.

The technology finally caught up with the chemistry when the knowledge gained by taking apart the hot ones of 1978 and 1979 was applied to the day to day production of all units. But the laws of physics remained pretty much the same, and when it became practical and possible to turn out 120 and even 100 degree units with the same ease that 280 degree units were being turned out in 1976 and 1977, it also became apparent that GaAs-FET technology had just about reached the end of the line.

No single advance in LNA technology changed the world we now know; but one single market force did. And that was mass production. As long as the marketplace was for 100 or 200 LNAs per month, there was no real incentive to spend the millions of dollars it took to bring the noise figure 'down' and the 'yield' up. The big research and development dollars that went into figuring out the 'optimization techniques' to improve GaAs-FET technology was spent in 1978 and 1979. But the new technology was not really applied until 1980 or so, when it became apparent that the 'LNA universe' was going to be thousands of units per month, quickly.

Throughout all of this, the prices slowly came down. By 1979, 120 degree units were almost standard although many 150s were still being sold. The price hovered around $1800 for an LNA with a 120 degree noise figure when the first SPTS came along, although some $995 units with lower gain (30 dB) were shown at SPTS. One year later the prices for 120 degree/50 dB gain units had dropped to around $800 at the TVRO dealer level. Today they are under $400.

We said early on that there were **two considerations for the LNA;** the noise temperature or noise figure, and, **the gain.** The noise temperature was the essential ingredient since it directly translated into smaller antennas, or better pictures with a fixed antenna size. It works this way.

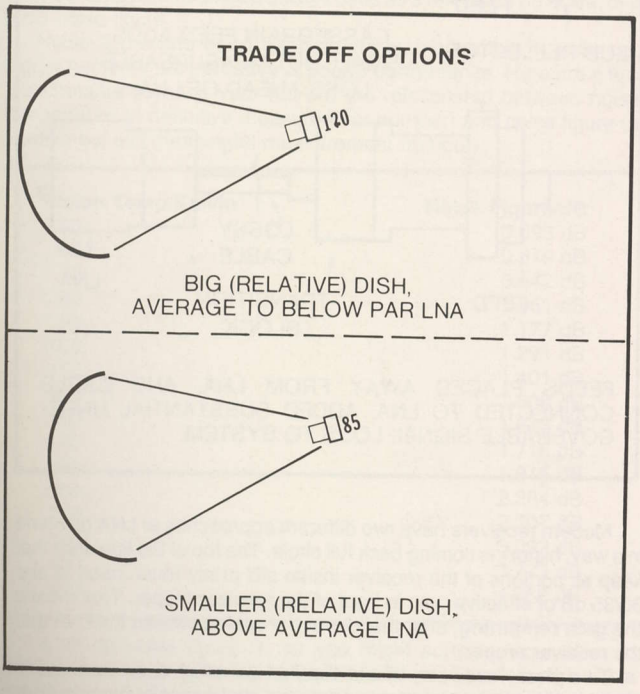
For all practical purposes, at a given location on earth the TVRO

'sees' a stable, non-changing signal strength level from the satellite. To be sure, there are minor changes in signal level when there is a heavy thunderstorm directly in the path, or if the satellite deviates out of position slightly, but these changes are usually very short lived. The only other change worth making note of is the linear reduction in satellite signal power as the satellite ages. A new satellite, working as intended, may lose from 2 to 3 dB of on-earth signal strength before it is taken out of service (in North America; Russian Ghorizont birds may drop 6 dB or more before being replaced).

If the signal is, for short periods of time such as a year or less, stable, then it is up to the TVRO system designer to figure out what he can do with the signal that **is** present. A properly designed big antenna will capture more signal than a properly designed small antenna. That is a variable in the designer's hands. It also turns out that a properly designed big antenna will capture **less** of the noise always present from the earth and trees surrounding the antenna, than a properly designed smaller antenna.

And, it also turns out that because the satellite signal is so weak, that it can be covered up (or eliminated) by noise from the earth plus noise contributed by the LNA. There are, therefore, numerous combinations possible between antenna size and gain and LNA noise temperature which will result in noise free television pictures on the screen. **You can use a big antenna,** which captures more signal, and an LNA that is not so good; it works because you have more signal available (from the antenna) to 'drown out' the more noise coming from the LNA.

Or, **you can use a smaller antenna** and a better (i.e. 'lower noise') LNA. But, there are limits to this trade off sequence. Part of the limitation comes from the antenna itself; there is a practical size, below which, the antenna feed system begins to contribute appreciable amounts of **earth** noise. Noise, whether it comes from the LNA, or the earth, or both, is the same noise. With the present antenna technology, the small-end antenna size limit, below which earth-noise from the antenna feed system begins to become a problem, is someplace around 8 to 9 feet antenna aperture (distance across). Yes, smaller antennas do produce signal, but they also have a built-in noise factor which cannot be overcome with a better LNA. Remember, noise is the same whether it comes from the LNA or antenna, and even a perfect LNA (i.e. one with no noise) cannot make up for an antenna that is contributing noise.



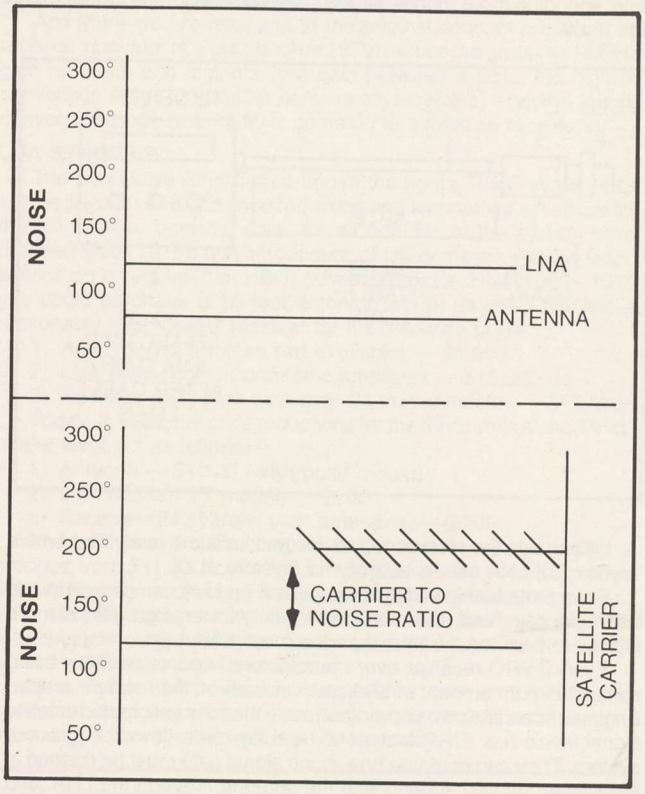
Recall that if you point an LNA with feed antenna attached **down,** directly at the earth, the feed antenna will see 'noise.' That noise will be close to 300 degrees Kelvin. The LNA may well be a 120 or even an 85 degree unit, but the system noise temperature at that point will be determined by the higher earth noise; not the LNA noise.

It is almost impossible to have such a poorly designed antenna plus feed that your **'system noise temperature'** (defined as the net result of LNA temperature PLUS antenna received noise/temperature) is the **same as** the earth noise. However, poorly designed antenna feeds can see 'around' the dish surface, to the earth behind and below the dish, and produce noise from the earth which is strong enough to make the LNA's own noise temperature less a factor in overall 'system noise temperature.' We will look at this portion of the system in a subsequent part of this series.

The important element to understand here is that at some point in the design of the system, a better (i.e. lower noise) LNA will **not** improve the performance of the system itself. Why? Because the noise temperature of the antenna (plus feed) becomes the primary noise contribution element, and this system is only as good as the 'weakest element in the chain.' If the antenna contributed noise is greater than the noise from the LNA, then improved LNA noise temperature will buy you nothing additional.

And this says that a small dish, while still perhaps producing suitable levels of signal, is also producing **un**suitable levels of noise. And in the final analysis, what determines the quality of the pictures we receive is a "ratio"; the difference in signal strength at the receiver between the desired product (the satellite signals) and the undesired product (noise).

This 'ratio' is represented in TVRO technical terms by a measurement factor termed **"Carrier-To-Noise Ratio."** It is abbreviated **CNR** for short. And CNR is simply the afore-mentioned difference between the good guy (the carrier) and the bad guy (the noise; any noise, from any source). The typical system CNR is established, once and for all in the system, by the LNA. More specifically, it is established by the ultra low noise GaAs-FET stages of the LNA.



LNA **gain** is a measurement of how many times the original (input) signal power is amplified or increased. It uses the same measuring stick, the dB (decibel) as the antenna gain. Gain is important for two reasons:

1 You need some gain, in the LNA at 4 GHz, to establish a system noise temperature. You must have amplifier 'stages' or sections

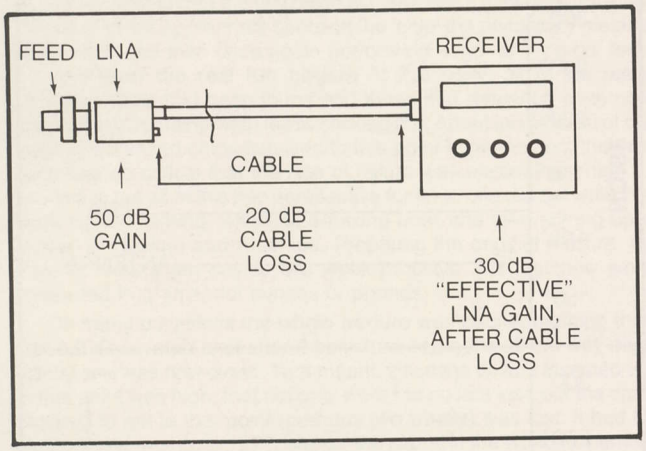
made up of transistors to get that gain.

2) You need to compensate for the loss of signal which will occur as the amplified signal is carried through cable from the feed-horn/LNA to the receiver proper.

The very first home receivers offered for sale had varying amounts of LNA-required-gain. Early Paul Shuch designed ICM receivers, for example, often did just fine with LNAs in the 30 dB gain region. This caused Dexcel, with their first home-TVRO products (Dexcel was the first LNA manufacturer to 'recognize' the home market), to bring out a lower priced LNA with 30 dB of gain. It was intended as the LNA-mate to the early ICM receivers.

ICM's Paul Shuch believed in something called 'balanced gain.' Paul's early ICM receivers attempted to balance the total LNA plus receiver gain between the three primary portions of the electronic receiver system; the LNA, the 1200 MHz upper or high 'IF' and the 70 MHz lower 'IF.' This will make more sense when we take this series ahead into receiver history and design. Shuch told receiver users not to select LNAs with more than 30/35 dB of gain, but he also told them that they could not tolerate more than 5 to 6 dB of cable loss between the LNA and the receiver proper. This told the user, if he understood what he was doing, that he would have to use some of the then (and now) expensive one-half inch 'hardline' cable since normal flexible type cables had far too much loss if the run from LNA/feed to receiver was more than 25 to 30 feet.

Another early home receiver pioneer, Andy Hatfield of AVCOM, took a different approach. Andy felt that hardline was not only expensive (up to $2 a foot) but the special connectors were also expensive, and difficult to install properly for a novice. Andy also saw that the hardline had to be installed very carefully or the user could 'kink' and damage it. Andy therefore suggested to users that they use a 'standard' 50 dB gain LNA, but substitute the far less expensive flexible cable and less difficult to work with type N connectors. In Hatfield's eye, spending more money for the LNA, but less for the cable, was a fair trade.



Ultimately, the market would follow Hatfield's lead. The whole 'mystery' of LNA gain is actually no mystery at all.

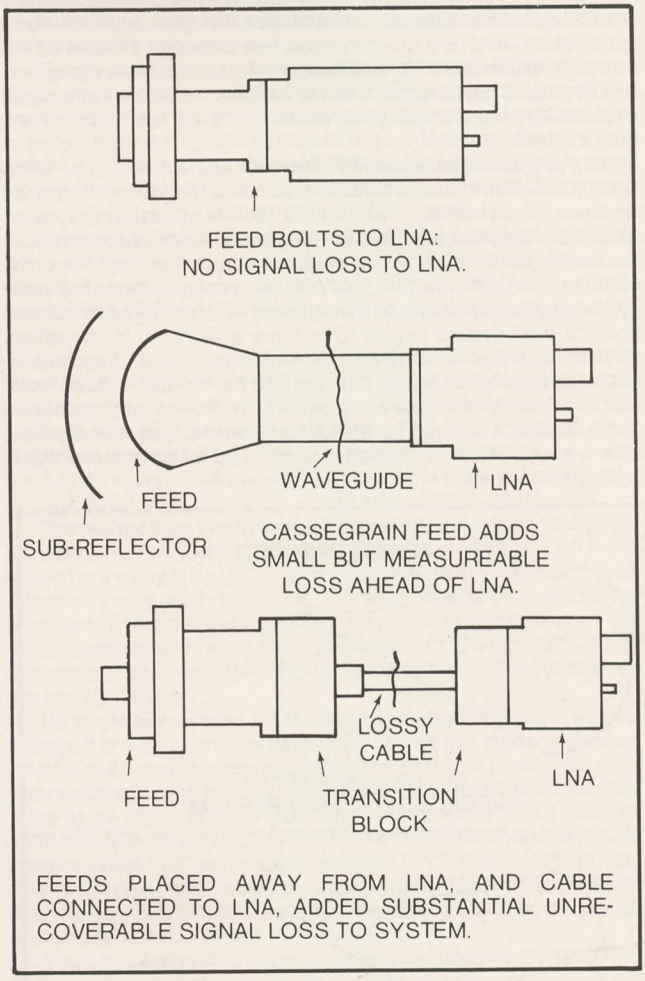
For a particular installation or system, an LNA can have both too little LNA gain, and, too much LNA gain. Not enough gain is more difficult to cure, on the site, than too much LNA gain.

Every TVRO receiver ever manufactured counts on there being some minimum amount of LNA gain 'in-front-of' the receiver proper. Engineers can sit down knowing no more than the anticipated satellite signal levels (i.e. EIRP footprints), and lay out a downlink (ground) system. They can compute how much signal gain must be created in the system proper; starting with the antenna, through the LNA, and finally within the receiver proper. Things that lose signal, such as the feedline, are 'negatives' and from the total gain of the antenna, LNA and receiver, such negatives must be subtracted.

Gain, then, must accomplish two goals; overcome whatever cable loss as may be present, and, act as the 'first/remote' stages of the receiver proper. Knowing how much gain to select in an LNA has always been 'bothersome' to system installers. So they take the easy path, and simply use a 50 dB gain rated LNA, sure that since that is the most gain commonly available, that should do the job.

With the early ICM receivers, if you placed a 50 dB gain LNA in front of the receiver, you usually ended up with badly distorted pictures. The receiver was designed for less LNA gain, and when you had 50 dB of LNA gain the receiver's latter stages simply could not handle the additional signal 'voltage.' They were 'overloaded' by the excess signal. But there was a 'simple' field fix if you found yourself with one of those receivers and too much gain; you simply extended the length of the feedline, which added loss between the LNA and the receiver, and that reduced the signal voltage reaching the receiver proper.

The early AVCOM receivers also really only **required** about 30/35 dB of LNA gain in front of the receiver, but because of the design approach taken by Andy Hatfield, the receiver could stand additional gain without overloading. Up to a point. **LNA gain,** then, can be thought of as 'water pressure' in a water line. You need sufficient pressure (gain) to get the water (signal) from the input (antenna) to the output spigot (receiver). You know that some of the pressure (signal voltage) will be lost along the way, and you plan for that factor.



Modern receivers have two different approaches to LNA gain and in a way, history is coming back full circle. The top of the line units that keep all portions of the receiver inside still pretty much need to see 30/35 dB of effective gain in front of the receiver proper. That means **the gain remaining,** after the loss in the cable between the LNA and the receiver proper.

Two-piece receivers, where the first (or only) down conversion stage is located in a separate container that typically mounts at or close to the antenna, can get by with less 4 GHz (LNA) gain simply because there is no, or almost no cable loss. By placing the down conversion stage(s) at the antenna, the super high frequency 4 GHz

signals never travel through more than a token length of cable. The LNA gain requirement now boils down to having a small reserve for the short cable piece that may (or may not) be required from LNA output to downconverter (many of the new LNC units are one piece, and the 4 GHz signal goes in through the feed antenna while the lower frequency or 70 MHz IF signal comes out of the container), and, having sufficient gain to establish a 'system noise temperature.' Now what is that all about?

The typical receiver (actually the first receiver conversion stage, or the downconverter) has a 'noise temperature/figure' of its own. It is a rather high number. It is such a high number that the TVRO receiver (downconverter) is really like a 1920ish 'Crystal Set.' It detects the signal alright, but it has very little real sensitivity. The sensitivity of the receiver system comes **not** from the receiver proper, but from the **LNA ahead of** the receiver.

There are engineering rules of thumb which tell you how much gain or signal amplification you must have **in front of** (or ahead of) the receiver, to turn the LNA sensitivity into system sensitivity. There are no bending of these rules; if your receiver (downconverter) noise temperature is 'X,' you MUST have so many dB of low noise gain in front of the 'X noise temperature' receiver, or the total system sensitivity will not be equivalent to the low noise factor of the LNA and antenna combination. The dB of low noise (i.e. GaAs-FET) gain required in front of the receiver varies proportionately with the noise figure (temperature) of the receiver.

Receivers are often **noise figure** rated. A common number is 12 dB Noise Figure. That means the receiver has built-in noise equal to **12 dB more than** a perfect receiver with **no** noise. Do not confuse the receiver noise figure with the receiver threshold; we'll explore that specification (typically 8 dB) in a later part of this series.

A 12 dB noise figure receiver will create a 12 dB noise figure system **unless** the LNA in front of it has a far lower noise figure (temperature), and unless there is sufficient LNA gain to override the noise figure (temperature) of the receiver alone. By now we are tossing about noise figure and noise temperature as if the two are the same. For our purposes, they are so close to being the same that we can **almost** use the two terms interchangeably. Noise temperature is a hard number; so many degrees of noise temperature is a specific amount of noise. Noise figure is a relative term, but it equates directly to noise temperature since it always uses as a reference no noise, or a 0 dB noise figure.

Noise figure and noise temperature also have this in common: bigger numbers are indicative of poorer performance. Here are a few 'benchmarks' to hang your hat on; the relationship between noise temperature (a definitive measurement number) and noise figure (a relative but still meaningful measurement number):

Noise Temp/Kelvin	Noise Figure/dB
50	0.693 dB
60	0.819 dB
70	0.942 dB
80	1.061 dB
90	1.177 dB
100	1.291 dB
110	1.401 dB
120	1.508 dB
130	1.613 dB
140	1.716 dB
150	1.816 dB
200	2.284 dB
250	2.707 dB
300	3.092 dB
400	3.773 dB
500	4.362 dB

A 12 dB noise figure is, as you might surmise, equivalent to thousands of degrees Kelvin noise temperature. A ten foot dish with a 500 degree K(elvin) system temperature will just barely tell you that there is video there, in the center of the US. And that's with a 4.362 dB noise figure. You can imagine how ineffective a 12 dB noise figure receiver will be, even if there is substantial LNA **gain** (but **not** low noise figure gain) in front of the receiver.

Generally speaking, and this is a rule of thumb and not an engineering design equation, if you want the system noise temperature to be established by the LNA noise temperature, you must have between 2 and 3 times more voltage gain in the LNA than you have noise figure (in dB) in the receiver. That means that if the receiver has a 12 dB noise figure, the LNA must have sufficient total voltage gain (**and** low noise figure) to be equal to 2 to 3 times that noise figure, in dBs of gain. Twice 12 is 24 and three times 12 is 36. And this tells us the low noise LNA stages, using GaAs-FETs to establish the ultra low noise factor, must have at least 24 dB **of gain** and perhaps as much as 36 dB of gain.

And this brings us around the full circle of the LNA design. You need sufficient gain to overcome transmission line losses (very little or no gain if the LNA is part of the downconverter, in an LNC format), **and,** you need sufficient gain to override the noise figure/factor of the first downconversion stage; from 24 to 36 dB of gain for this function. An LNC unit eliminates one of these requirements, but **not** the other.

When 50 dB gain LNAs were 'standard' (many were rated as high as 60 dB of gain, which is fine for reserve **but seldom is required** unless you are running exceptionally long runs of high loss transmission cable), LNA manufacturers typically designed the LNA with **two** stages of GaAs-FET amplification (the first two stages, to create a very low noise temperature), and then followed those GaAs-FET stages with 'bulk gain' stages using far less expensive 'bi-polar' family transistors. The bi-polar transistors are adequate for amplification, **provided** the low noise factor has already been established by GaAs-FET stages **ahead** of the bi-polar stages. When the LNC came along, or as the two-piece receivers became available, the additional gain provided by the 'bulk gain' bi-polar stages was no longer essential. Thus they were removed, totally or all but one of the bi-polar stages, to reduce the LNA gain to a level which reflected the real needs of the antenna mounted downconversion system.

And there we are returning to the original concept preached by receiver innovator H. Paul Shuch in 1979; reduce the amount of 4 GHz gain required, and 'balance' the gain between 4 GHz, the high IF conversion stage (in double conversion receivers) and the low IF conversion stage (the 70 MHz common to almost all receivers).

LNA SYNOPSIS

The Low Noise Amplifier portion of the home TVRO system has set the pace for all of the price reduction and technology advances for the full system. User net costs for all portions of the system have dropped since 1975's first introduction of US domestic satellite video service on a 'regular' (i.e. HBO) scheduled basis. However, in 1975 you could purchase a 10 foot antenna, a 120 degree LNA and a reasonably good quality receiver for the following prices:

1) Antenna (polar mount **not** available) — $4,900
2) LNA (**non**-cooled parametric amplifier) — $15,000 up
3) Receiver (field tune-able over 24 transponders) — $12,000

Today, in 1982, the price reductions for the three units at the TVRO dealer level are as follows:

1) Antenna — $1,100 (**with** polar mount)
2) LNA (GaAs-FET model) — $400
3) Receiver (24 channel user tune-able) — $700

And for those who like comparisons, the total package price has dropped from $31,900 to $2,200 in less than seven years; a drop to 6.9% of the original pricing. The LNA portion, however, has dropped to 2.7% of its 1975 cost and in many ways it has been the development of the LNA technology (quality and quantity) which has paced the way for all that has happened in this field.

Next month the series continues with a look at the slow but persistent changes in antenna technology, and how these changes have shaped us into the industry we are today.

OUR COVER —

A Paraframe (Jim Vines) 7.46 meter ET/7.46 reflector surface is lifted onto the pedestal in Tegucigalpa, Honduras. Father Valentine operates the terminal there for the Instituto San Fransicco. Yes, US television comes in just fine, thank you.

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ENTERTAINER HR 101	575
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DRAKE	735
ARUNTA 416 with built in stereo processor	950
AVCOM COM 2 with modulator	800
AVCOM COM 11	1000
AVCOM COM 65	1500
AVCOM COM 3 or 3R	1850
EARTH TERMINAL "WASHBURN"	1500
DEXCEL 1100 W120° LNC with built in modulator	1450
GENERAL INSTRUMENTS	2325
STANDARD COMMUNICATIONS (MASTER)	1925
(SLAVE)	1725

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ADM 20'	**7500**	VIDARE 10'	**975**	BETA 12	**1100**
ADM Extender panels	**300**	VIDARE 13'	**1380**	SAVAC SAR 10'	**1500**

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AVCOM MODULATOR (Crystal Controlled)	**75**
TRANSIFIER COMMERCIAL (Channels VHF or UHF)	**360**

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CHAPARRAL DUAL FED	**140**
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WETTING AMERICA'S APPETITE FOR TELEVISION (Part One)

Freeze

The budget of the Federal Communications Commission in 1949 was approximately 8 million dollars. By mid 1949 the American public had invested approximately 500,000 million dollars in television receivers and another 50 million dollars in antennas and accessories to receive television. Television broadcast stations had invested up to 100 million dollars in their facilities, and another 25 million dollars in various support services (Bell microwave, etc.). *The whole scheme ground to a screaming halt* on September 30th in 1948 when the FCC, with all of their 8 million dollars annual budget, called a halt to the granting of new television station application processing.

The freeze was going to last "just a few months". Then it was going to last "a year... no more". Later it would last "no more than two years". Before it was all over, it lasted nearly four years, a period during which no new television stations were authorized in the United States, *and a period during which television, for 107 established VHF stations, became very, very profitable.*

There were television stations in 63 market areas when all of the pre-freeze stations finally got on the air. They broke down, as shown in Table 1, to cities which primarily had one outlet each, although a few had two and a handful enjoyed three outlets with New York City and Los Angeles having 7 stations each.

The reason for the freeze was simple and straight forward. When the United States returned to peacetime at the close of World War II, the television broadcast standards established in 1939 and 1940 called for 19 VHF-only TV channels. They were spaced 6 channels in what is now low band (channel 1 existed at that time, but was subsequently removed from TV service), and 13 in what is now high band plus what we generously call in CATV *"super band"*. However, during the war time era, the military found out that the pre-World War II VHF frequencies from 30 to 300 MHz were *not the useless frequencies* they assumed them to be prior to the war. In fact, the VHF

Where It All Began

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TABLE ONE
CITIES WITH TELEVISION

Birmingham	2 stations	Buffalo	1 station
Phoenix	1 station	New York	6 stations
Los Angeles	7 stations	Rochester	1 station
San Diego	1 station	Schenectady	1 station
San Francisco	3 stations	Syracuse	2 stations
New Haven	1 station	Utica	1 station
Wilmington	1 station	Charlotte	1 station
Washington	4 stations	Greensboro	1 station
Jacksonville	1 station	Cincinnati	3 stations
Miami	1 station	Cleveland	3 stations
Atlanta	2 stations	Columbus	3 stations
Chicago	4 stations	Dayton	2 stations
Rock Island	1 station	Toledo	1 station
Bloomington	1 station	Oklahoma City	1 station
		Tulsa	1 station
Indianapolis	1 station	Erie	1 station
Ames	1 station	Johnstown	1 station
Davenport	1 station	Lancaster	1 station
Louisville	2 stations	Philadelphia	3 stations
New Orleans	1 station	Pittsburgh	1 station
Baltimore	3 stations	Providence	1 station
Boston	2 stations	Memphis	1 station
Detroit	3 stations	Nashville	1 station
Grand Rapids	1 station	Dallas (Ft. Worth)	2 stations
Kalamazoo	1 station	Ft. Worth (Dallas)	1 station
Lansing	1 station	Houston	1 station
Minneapolis	2 stations	San Antonio	2 stations
Kansas City	1 station	Salt Lake City	2 stations
St. Louis	1 station	Norfolk	1 station
Omaha	2 stations	Richmond	1 station
Newark (N.Y.C.)	1 station	Seattle	1 station
Albuquerque	1 station	Huntington	1 station
Binghampton	1 station	Milwaukee	1 station

frequencies pressed into wartime service turned out to be the *best all around frequencies* for the military. So they came back from the war and immediately set out to capture for their own use as many of the VHF frequencies as they could. In their frequency battle, they won the top 6 VHF TV channels (14-19); this left television with 13 VHF channels. Then the two-way communications people made a passioned plea to have channel 1 removed to their domain, and they won (for which we *should*, as TV users, be eternally grateful because it turned out that old channel 1 was susceptible to long range world-wide short-wave-like propagation a high percentage of the time, which would have rendered it useless for TV service).

This left the television world with 12 VHF channels. But no one, in 1946, showed much concern because after all in 1946 there were only 6 (or 7, depending upon whom you talk to) television stations on the air in the whole United States, and they *all* operated on channels 2-6. None had yet ventured to the "high band" channels of 7-13, and most experts felt that as expensive as television was going to be (for transmission and receiving) a nationwide grid of stations operating on the 12 VHF channels would provide *all of the service* that *anybody could ever want.*

With that in mind, the FCC settled down to process applications for new television stations in late 1946. There were 5,000 television receivers in use in the whole United States at the end of 1946.

Now about all the FCC did in 1946 when it established an "allocations program" was eliminate the channels television lost (channels 1, 14-19) in the post war trades, and, utilizing 1936-1939 developed data (mostly from RCA tests in that era), begin assigning stations to channels in the remaining VHF channel range. RCA had found in the 30's that regular television coverage for stations might extend as far as 55-60 miles. This was based upon 50 kilowatt transmitter power levels and 1,000 foot (above average terrain) antennas. So the Commission, rather arbitrarily as it turned out, chose the distance of 150 miles to keep stations operating on the same channel separated. Unfortunately for the whole United States, even this separation between stations on the same channel was not respected totally. If you will look at Diagram 1, you will see how the Commission chose to allocate (i.e. approve) operation by 6 stations on VHF channel 4 *prior* to the 1949 freeze. Most of these stations *were* 150 miles (more or less) from the nearest other same channel station, *but channel 4 Lancaster, Pennsylvania,* was much less than 150 miles from Washington; in fact it was not even 100 miles away. Nor was it quite 150 miles from New York City.

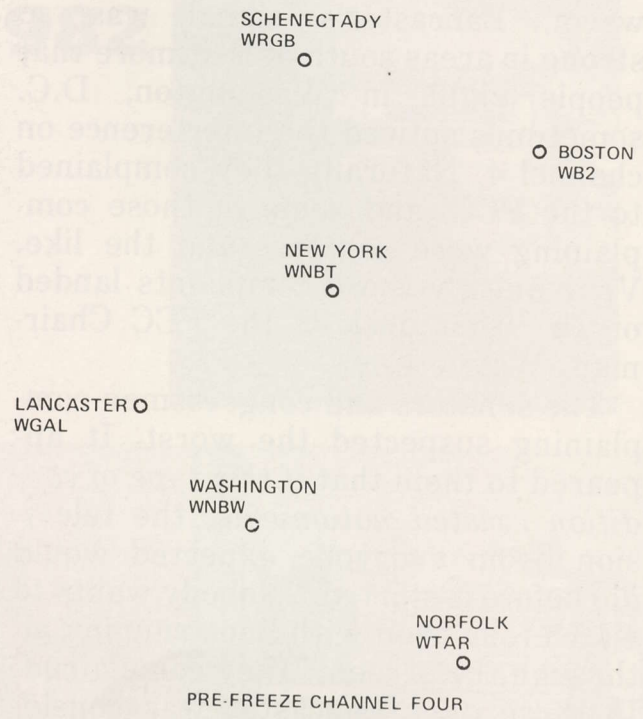


DIAGRAM 1

So Lancaster and Washington both had channel 4 stations, and it turned out that from Lancaster to Baltimore was only 53 miles and Baltimore to Washington a scant 40 miles or so. The end result was that people living north of Washington, up to and beyond Baltimore, had almost constant interference on Washington's channel 4 from Lancaster channel 4. *It was an idiotic mistake in channel assignments,* and for it *the whole United States would pay the supreme price:* a freeze in 1948.

When the weather conditions turned

warm, Lancaster's signal was so strong in areas south of Baltimore that people right in Washington, D.C. sometimes noticed the interference on channel 4. Naturally they complained to the FCC, and some of those complaining were senators and the like. Very quickly those complaints landed on the front desk of the FCC Chairman, Wayne Coy.

The senators and congressmen complaining suspected the worst. It appeared to them that *if this type of condition existed nationwide*, the television boom everyone expected would die before it started. "Nobody wants to watch television with lines running all through the screen," they complained. In those days Lancaster was considered pretty provincial and the audacity of a small town television station "way up in Lancaster" interfering with the new television reception of Senator this or Representative that was more than Washington could bear.

In actuality, the Lancaster-Washington-Norfolk triangle was probably the worst such situation in the whole country. *No where else*, with the limited number of television stations on the air at that time, did problems of such magnitude exist.

So the FCC, faced with the irate complaints of senators, congressmen, and the mayor of Baltimore decided it had better find out *what the problem was*. A wise soul at the FCC suggested that until the problem was identified, no new TV grants should be made, and his suggestion was bought in toto.

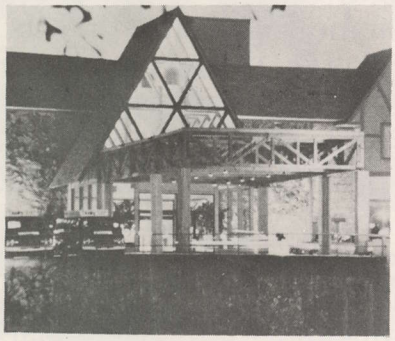
Now this kind of problem was quite new to the FCC. Yes, there had been a period prior to 1927 when the whole nation was up in arms over the uncontrolled radio broadcasters who seemed to *assign themselves frequencies*, and move frequency from day to day as the stations around them moved. But that had been dealt with quite nicely by the Federal Radio Commission after 1927 when all stations were "assigned frequencies" on which to operate. In 1948, the FCC assigned the frequencies in question, and other than the Lancaster-Washington-Norfolk triangle, the rest of the nation was not (yet) *really* in bad shape. Ninety percent of the Commission's instant problems *could have been* eliminated by making a simple channel change for Lancaster. Right then, on the spot. Lancaster ended up on channel 8 anyhow *after* the freeze. But no, the FCC left Lancaster on channel 4 and the senators and representatives and mayors who were buying new sets every day continued to experience interference on their Washington reception on channel 4 for years and years and years. It is not hard to envision the kind of ani-

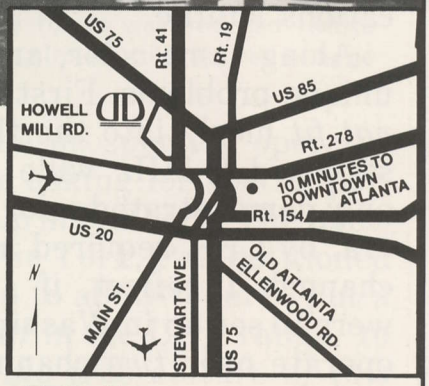
MAJOR CONTRIBUTOR TO FREEZE

WGAL-TV Lancaster probably only wished to provide television reception to the folks of Southeastern Pennsylvania, but an FCC allocations boo-boo placed them on a channel shared by nearby Washington's WNBW and New York's WNBT. The result was disastrous interference, and a shut down of new TV expansion in the United States.

ANNOUNCING . . .

the TVRO Event of 1982





THE SATELLITE INTERNATIONAL BUSINESS CONFERENCE

Atlanta, Georgia — October 29, 30 and 31

BY POPULAR DEMAND from both registrants and exhibitors, the Ninth Satellite Television Technology Seminar / Trade Show will be held at the Dunfey-Atlanta Hotel in **Atlanta**, Georgia, on October 29, 30 and 31, 1982.

JUST AS YOU SAW at the STT Trade Show in Fort Worth in March, the **Atlanta** event (abbreviated to "SIBCO") will once again bring to one meeting place all of the leading TVRO manufacturers, distributors and dealers plus hundreds of earnest, eager businessmen wanting to enter this vital, growing business. You will see 100-plus exhibits of all the latest TVRO equipment, 60-plus satellite antennas of every description.

IN ADDITION, there will be three days of hard-hitting private terminal training for newcomers to this field. Once again, TVRO industry leader and Coop's Satellite Digest publisher, **Bob Cooper, Jr.**, will be master-of-ceremonies and director of seminar training. Lecture attendees will again receive the STT "Gold Seal" Certificate of Educational Achievement for attending these sessions.

FOR FULL INFORMATION On exhibiting or attending this outstanding STT satellite system event, contact Rick Schneringer at STT, P. O. Box G, Arcadia, OK 73007. Telephone 1-800-654-9276. (in Oklahoma, call 405/396-2574)

mosity that developed towards the FCC in those years; not only had this federal agency shut off television for their constituents in Colorado or Oregon or wherever, but they were the cause of the interference on Washington's WNBW, right there in the suburbs of Washington! On the surface it is diffucult to fathom how the FCC could let the situation drag out even one week, not to speak of four years.

The allocations shuffle should have taken a few months, perhaps six at most, even with bureaucrats handling the problem. The problem was simple enough: create a new table of assignments so that stations would operate without interference to one another's service areas. But *the issue was enlarged* even before it got into the allocations shuffle.

Along came color, and it presented unique problems. First of all color *did not fit* nicely into the then (and now) standard 6 MHz wide channels. The only demonstrated color system of that era, by CBS, required a 12 MHz wide channel. In effect, if a color station were to set up in Washington, it would operate over *two* channels, such as 3 and 4, *at one time*. This bothered the Commission because if *this* was the way color was going to be, then *somehow* the allocations table would have to find room for the twice-as-wide-as-black-and-white colorcasts.

Diagram 2 illustrates the problem.

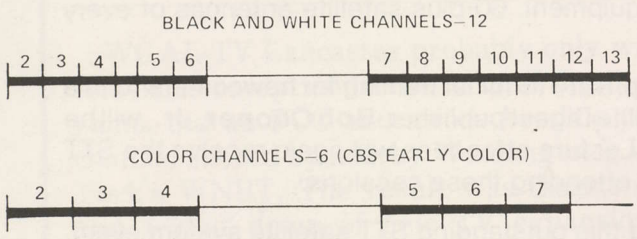


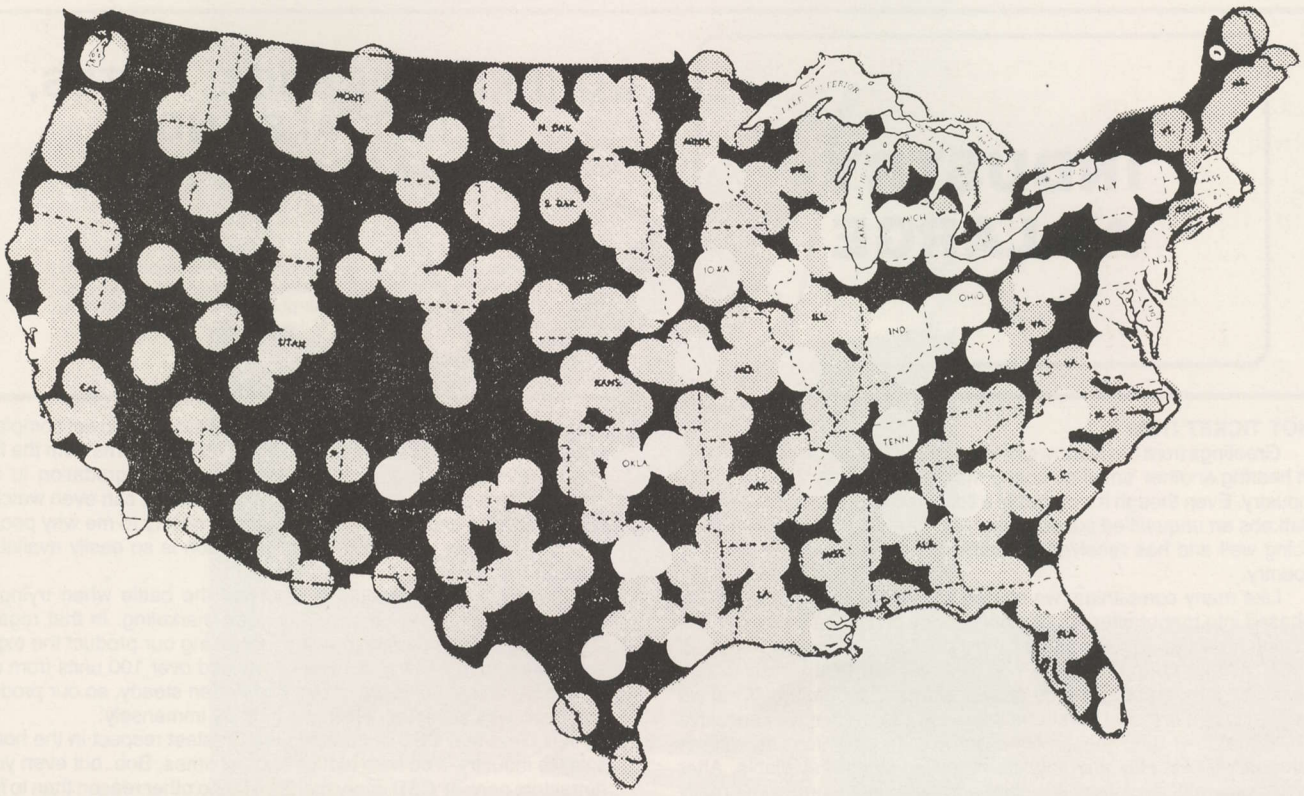
DIAGRAM 2

OK - *so color was an unknown.* It might require a whole new allocations scheme. At least that is the way it looked in 1948 when the freeze began. However, by 1949, the color question was pretty much solved as far as making it fit into a standard 6 MHz wide channel was concerned. Technically, by 1949 *it presented no problems* to the allocations table that would be established for normal black and white operation. But the Commission would *fail to announce that fact* until 1951, allowing the senators and others on their backs to continue to believe for several more years that color was "one of the problems" effecting the release of the freeze.

Then came the UHF problem. Somewhere along about in the winter of 1949 a belief developed that the 12 VHF channels then available to television were *not adequate* to cover the nation. It turned out this was a perfectly valid assumption. Diagram 3 shows the coverage of the United States which was available with only 12 VHF channels to allocate nationwide. The white areas represent coverage areas for stations granted permission to broadcast before the freeze came along; the gray areas represent new, unused (at that time) allocations *using the 12 VHF channels only.* The dark areas are regions where *no television reception* could be expected, if the nation *only* had the 12 VHF channels with which to work. Clearly, something had to be done to bring television to all of those "black areas".

In 1949 at the National Association of Broadcasters Annual Convention, FCC Chairman Wayne Coy sprang the news:

"...before many months there will be ul-



WITH VHF CHANNELS ONLY—The VHF stations on the air when the freeze was initiated (white circles indicate coverage), when added to the VHF channels proposed (grey circles) still resulted in large regions unserved by television signal contours.

tra high allocations which will open up a new frontier of the spectrum. It will be possible, given imaginative leadership, to take television service to all America...".

And to put down fears that the new UHF channels would not obsolete the millions of receivers already in the hands of the public, Coy said:

"...present television sets on the market will continue to obtain service from existing VHF channels; wherever a television signal is available from a VHF transmitter, the existing receivers will continue to render fine service for many years to come."

Dr. Thomas J. Goldsmith, Director of Research for DuMont Labs, reported at the same NAB meeting:

"When the UHF channels become available, the public will be able to buy at a modest price converters which will bring the additional channels to their receivers."

With the cat out of the bag that UHF was coming, one prospective operator wasted no time asking for *special* permission to set up shop there. The operator of WNOW in York, Pa., petitioned the Commission to allow them to put a station on the air in the UHF range *"to allow tests of the true stature of this new frequency range"*. Attorney Jack C. McKenna, representing WNOW, asked that a plan immediately allocating 6 UHF channels *in 30 cities then without adequate television reception* be approved so that (1) these cities could have television, and (2) the FCC could gain much needed test information about the potential of UHF and the problems which were sure to show up. The plan did *not* fly. but years later hundreds of new UHF broadcasters *would wish that it had.*

To Be Continued / September

INDUSTRY AT LARGE

CORRESPONDENCE, NOTES, REBUTTALS AND CHARGES . . .

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HOT TICKET ITEM

Greetings from the Northwest! We thought you might be interested in hearing another 'small company makes good' story in our satellite industry. Even though it's probably a little premature to call Northwest SatLabs an unqualified success, our first product (the TWEAKER) is doing well and has received favorable comments from all over the country.

Like many companies, we started as a distributor and gradually phased into manufacturing. Our philosophy of 'finding a niche' in the market led us to development of the TWEAKER prototype in May of 1981. At that time, using a TV set carried out to the dish to find satellites, interference, and so on was standard procedure. What we wanted was a low cost electronic metering device that was sensitive enough to fine tune the antenna and locate satellites, as well as operate with virtually any satellite receiving system available. After many stages of evolution, our chief engineer developed some really unique circuitry and put out a product that we think is near-perfect.

Of course, not everyone is excited about it. We've spoken to a few dealers that are not even interested in precision-tuning a customer's system. According to those dealers, if the customers do not complain, the picture is 'good enough'. Much of this attitude stems from the fact that an average customer can tolerate a little degradation in the picture. Some people, as you are no doubt aware, can even watch a **terrible** picture and remain content. It's a mystery to me why people tolerate less than perfection when perfection is so easily available. Each to his own.

Anyway, a good product is only half the battle when trying to achieve success. The other half is good marketing. In that regard, **CSD** has been the perfect 'medium' for giving our product the exposure it needs. In our first six weeks, we sold over 100 units from our **CSD** advertising. Followup orders have been steady, so our product has been well accepted which pleases us immensely.

It is clear that **CSD** commands the greatest respect in the home satellite industry. You take alot of flack, at times, Bob, but even your detractors peek at **CSD** every month, if for no other reason than to fuel their own criticism. Please keep up the good work, controversy and all. Thank you for the great exposure; we will continue to give **CSD** our advertising support.

Jeffrey L. Smiley
President
Northwest SatLabs
806 NW 4th Street
Corvallis, Or. 97330

Nicely said. Can you see us beaming more than 3,500 miles away? The TWEAKER is one of those new products which we know little about. If you will send a unit to the CSD **Fort Lauderdale office, we'll put it to work in the Turks and Caicos and get a report out to readers. Coop has been using a Sadelco Digital** (CATV type) **field strength meter, monitoring the receiver 70 MHz** (IF) **output, for years now, as a means of fine tweeking the dish at the site. But that is a hard way to go since this caliber of meter costs upwards of $1,000 now a days** (Coop got his years ago before the price jumped out of sight). CSD **'works' as an advertising medium because people do read** (and re-read) **every word in every issue. Life is filled with detractions and distractions. Detractions quit being distractions when they discover that their own venom only poisons their own efforts and spoils their own chances for success. Being a poison mouth is far easier than being a leader; it takes very few smarts to pick something apart and be only critical of others. Offering proposals for constructive growth** . . . that's where the challenge is!

PROVO IN OCTOBER?

Two members of my firm are interested in attending your proposed retreat on practical satellite technology in October. Please let us know as soon as possible when you decide upon a date. Texas International has flights to Fort Lauderdale priced at $73 each way. We are not sure how long that price will be available.

Mary Jo Rosecan
Satellite Technology, Inc.
2302 Preston Trails Cove
Austin, Texas 78747

See Coop's Comment **in this issue of** CSD. **We are slanting towards the middle of November but require rapid feedback from those SERIOUSLY interested before reaching a final, unbend-**

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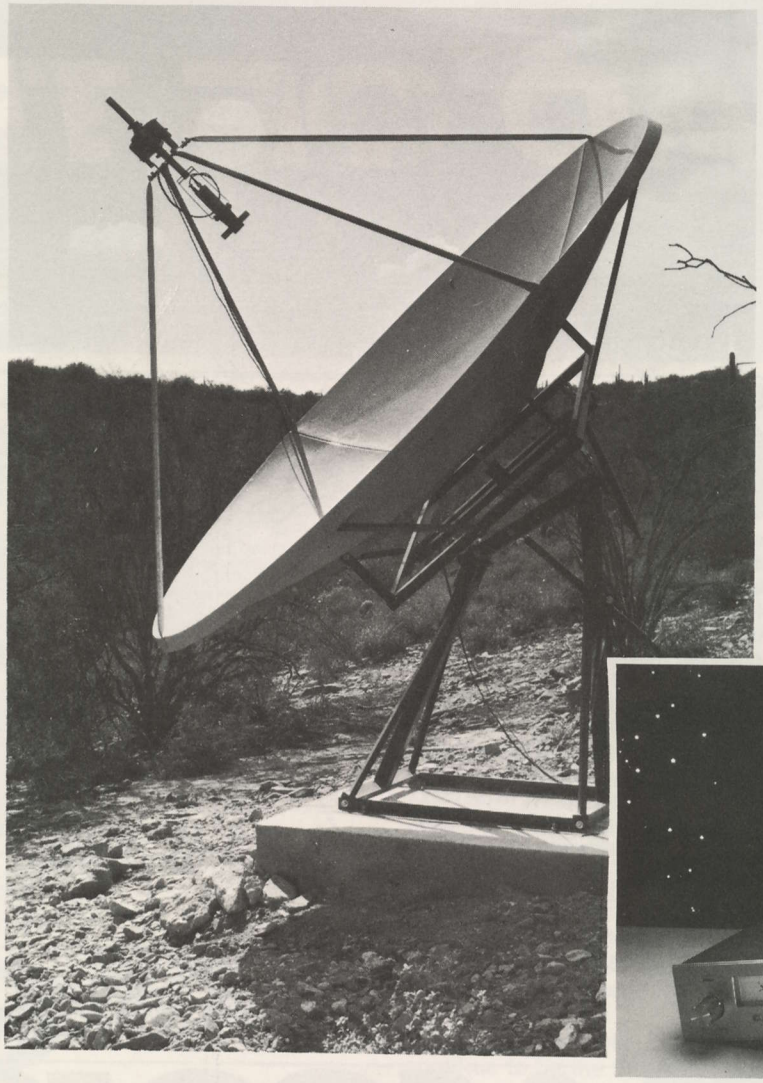

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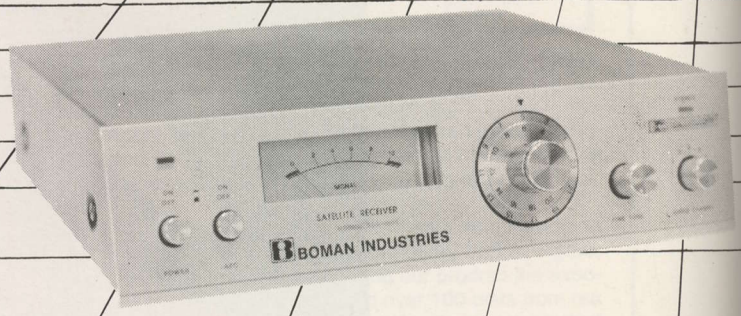
SPECIFICATIONS ■ Frequency Range: 3.7 to 4.2 GHz • Type: Single Conversion Superhterodyne ■ Radio Capacity: 525 Line Video + Audio ■ Input Level: 70 MHz: 0 to -40 dB ■ Noise Figure: 16 dB max. ■AFC Range: ± 10 MHz max. ■ Local Oscillator Radiation: -60 dBM max. ■ Intermediate Frequency: 70 MHz ■ If Bandwidth (@ 70 MHz): 30 MHz min. ■ Primary Power: Source: AC 105 to 125 V 60 Hz Consumption: 15W max. @ AC 117V, 60Hz ■ Size: 11⅝W x 9½D x 3H ■ Weight: 7 lbs. (3.2 Kg)



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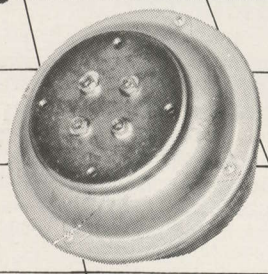

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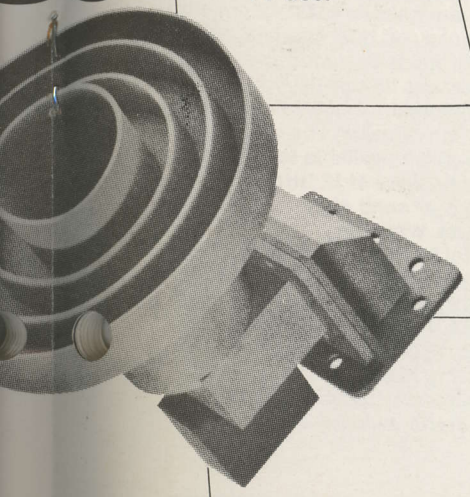
The BOMAN SAT-VISION KR-250 Rotor Kit FEATURES: ■ "Whisper-quiet" design for silent operation ■ Color-coded polarity dial with operation light ■ 100° rotation field to prevent cable snarl ■ Specifically designed for Satellite TV use.



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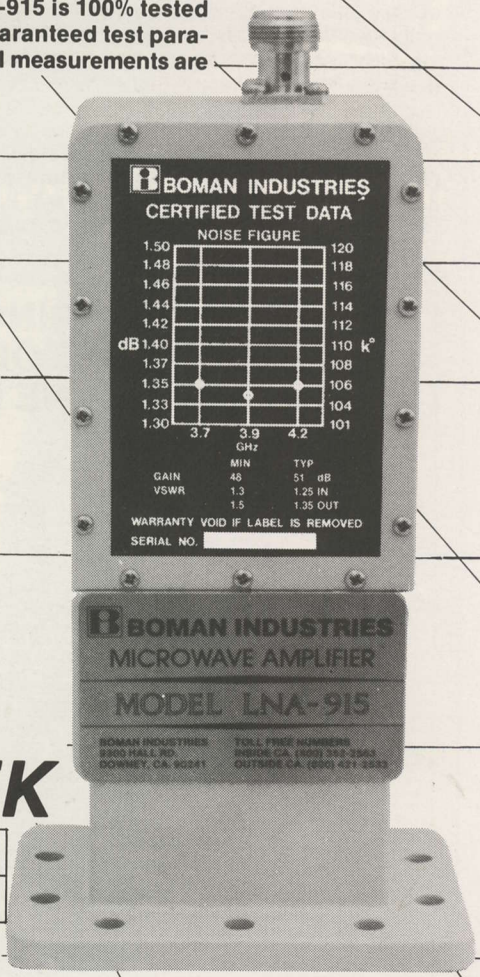
The Boman Model LNA-915 is 100% tested and marked for each guaranteed test parameter prior to release. All measurements are taken with equipment calibrated and maintained in accordance with Military Standard MIL-C-45662. We at Boman believe our continuing research and development of Satellite Receiving equipment will insure that all Boman products will continue to be the finest you can buy.



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1-5 UNITS	6 UNITS	24-UP
741.50	555.50	499.50

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able decision. TI will probably maintain their $73 rate only long enough to sweep up the crumbs left after the Braniff fiasco. We hopy you have better luck getting ahold of TI reservations than we did from Fort Lauderdale. We tried for two solid days, using first their Fort Lauderdale telephone number and then their 800 number, to get through, and finally ended up contacting American. Maybe if they charged more for their seats they could afford to put in a 'second' reservation line and hire another agent!

BOLIVIA?

I am looking for assistance in extending television to an isolated Bolivian town or towns. My father and I sell solar equipment there already. Can you provide any lists of information about over the air or cable television systems? These towns want television very badly and I am trying to find out if satellite reception is possible.

Daniel LeFever
Casilla 1341
Santa Cruz, Bolivia

Recent experience suggests that even with the extended service reach of Westar W4 (see report this issue) **Bolivia is still too far south to make the grade for direct US domestic satellite reception. However, the new Argentine national television service, now on full transponder Intelsat hemispheric service, will provide high quality** PAL-N **type color Spanish language video into Bolivia. We are preparing a report on the service from this new satellite feed and will publish it shortly. Brasil's** PAL-M **service also continues to be available, but the Portuguese language would probably be a deterrent to successful use in Bolivia. Either service would require a six meter dish for reasonably good quality signal acquisition.**

$UP TO $250,000 TO SPEND

The University of Maryland Language Media Center is considering the purchase of a satellite dish (earth station) to access non-domestic satellites for our foreign language courses. I am well aware of the problems involved with that project. So far, costs for an Earth Station capable of accessing foreign satellites has ranged from $40,000 to $250,000. I am writing to see if anyone can provide me with additional information on the equipment, and the satellites which could be accessed from this location.

James E. Royalty
Director
Language Media Center
University of Maryland
College Park, Md. 20742

We are certain numerous dealer-readers will contact you with their own proposals. A four meter dish system (cost in the $9,000 range with full automation) **would bring in US and Canadian services including** French, Spanish, Italian, **and a small amount of** Portuguese **programming. With a six meter dish, equipped with a circular polarized feed system, a location in Maryland could access additional international services from Brasil** (Portuguese), **Argentina** (Spanish), **Ghorizont** (Russian plus a smattering of additional languages such as German, Czech, Polish, et al). **A high quality automated, half and full transponder system with a six meter terminal will be in the $30,000 region. Hero Communications** (Hialeah, Florida) **is testing a new** 7.5 meter **polar mounted dish now, with it and circular feed adaptation, virtually any of the Intelsat birds serving Europe and Africa would be within reach; cost in the $50,000 region with full automation and switchable half and full transponder electronics.**

WHAT'S SPECIAL ABOUT 12 GHz?

In an interview appearing in the March issue, a knowledgeable person with National Microtech said "When 12 GHz comes off, we probably can make the higher band antennas ourselves". I am wondering what is so special about these 12 GHz antennas, except it being smaller. This statement has held me back from buying a 4 GHz terminal (16 foot mesh) since I don't want to buy twice. Will 12 GHz pass through the aluminum mesh easier then the 4 GHz signals? I thought that the only change required with 12 GHz was a change in the electronics. With 12 GHz service forecast for late in 1983, it is NOT that far off!

Orville Riley
Box 72
Runaway Bay, Jamaica

Excellent question. The 12 GHz signals are approximately 1/3rd as 'long' as the present 4 GHz signals. This tells us that the mesh will have to be tighter; or to be more or less precise, about 1/3rd the opening distances which we can now tolerate at 4 GHz. Since we seem to get by with maximum distance openings in the 5/16ths inch region now, that tells us that the opening 'tolerance' will tighten up about 1/8th of an inch. At that tolerance, the dish might as well be solid. The surface curvature accuracy we try to attain at 4 GHz is plus or minus 1/16th of an inch. Anything greater causes us signal loss which we cannot simply dismiss. At 12 GHz, the maximum tolerance will be in the vicinity of plus or minus 1/48th of an inch. Yup, everything gets more 'precise' at 12 GHz. Offsetting these tighter tolerances will be smaller antennas; antennas at 12 GHz act as big as antennas three times larger (physically) **at 4 GHz. A properly designed and built 4 footer at 12 GHz should have the same gain as a properly designed and built 12 footer at 4 GHz. So even if the tolerances tighten up, you have a smaller antenna surface area to maintain those tolerances across. All of that is moot,** however, **for Jamaica. The odds are that you will** not **have any 12 GHz service available to you for many, many years. One of the design features of 12 GHz birds is that they can control** where **they spill or send signal far more precisely than their 4 GHz counterparts. Whereas you get 4 GHz USA** (and Canada) **'spill over', you'll not be as fortunate at 12 GHz unless somebody really screws up designing the satellite transmitting antenna** (s). **If you want TVRO reception anytime in the next decade, we suggest you go with 4 GHz now, not pay any attention to converting the system to 12 GHz later on, and start enjoying the dozens of services already available to you. You'll get 12 GHz sinals in Jamaica** only when **somebody** wants **to send them to you; not when somebody starts sending them to the USA.**

BRIGHT NEW STARS ON THE HORIZON...

FREEDOM earth station receiver with SEVEN QUALITY features:

1. Signal strength meter. . .Allowing peak performance adjustments at a glance.
2. 24 Channel detent selector (with video fine tune).
3. Audio tune for all sub-carriers (5.2/7.6 MHz).
4. Scan tune. . .Automatically sweeps the satellite transponder band for signal detection.
5. REMOTE DOWN CONVERTER. . .Allows location at the dish for minimal line loss.
6. BUILT-IN MODULATOR. State of the Art allows channel 3 or 4 selection.
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Frequency Range	**3.6/4.3 GHz**
Threshold	**8 dB CNR**
IF Frequency	**70 MHz**
Bandwidth	**30 MHz Typ.**
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Level	**1 Volt ± 3 dB**
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Complete system adaptable to almost all existing systems. Includes programmable control, motor drive, bracket assembly and 100 feet of cable.

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RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to CSD Transponder Watch, P. O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505

FCC has given interim approval to the start of DBS (direct broadcast satellites). There were nine applicants who made FCC imposed deadline, and others subsequently have shown interest. Commission decided not to burden new service with many rules, adopted policy of allowing each operator to decide whether he wishes to function as common carrier (i.e. renting out transponder time to programmers), or, as broadcast service (such as local TV stations now operate). Existing rules governing both types of service will apply, as fits the operation of applicant. COMSAT continues to be front runner and is forecasting 1985/6 start up of service. Entire approval is actually considered to be final (i.e. non-interim), **except for** FCC decision that any approval from them must consider final results of forthcoming 1983 hemispheric conference which will determine how many DBS orbit spots each nation in western hemisphere will have available for use. That decision will in turn ultimately decide which of US and Canadian DBS services survive since a short-fall in orbit spots would limit number of separate, competing, DBS birds that could be made operational.

BIGGEST internal problem FCC wrestled with was what to do with those present day users of the 12.2-12.7 GHz (downlink frequency band) range. Millions of dollars are involved in moving existing users to another frequency band, and there is a shortage of microwave frequencies in congested urban areas to which present users could move. Ultimate solution to this one still hanging.

IMPACT on present 4 GHz service not likely to be great until 1987-88 at earliest. Public will have both 'bands' offered to them, in the form of hardware and programming. DBS propponents are betting that sufficient number of present 4 GHz 'desirable' services will have adopted scrambling by mid '80 period to drive end uses to 12 GHz. Scrambling will be regular feature of many of the 12 GHz service providers, but cost of receiving hardware will be low enough (in $500 range) that many users will be willing to trade lower equipment costs for recurring monthly programming charges.

NOT ALL 12 GHz proposed services will scramble, or be premium services. Several have indicated 'broadcast' type format with advertising support. Thus the seeds for problems similar to those already present at 4 GHz are shown; viewers will have choice, having selected hardware, of services that are, and, are not, scrambled.

NONE of the hardware **currently** being proposed for 12 GHz addresses viewers wishing to access more than a single satellite at a single, fixed geo-stationary location. If two or more 12 GHz programmed satellites do get on the air, and both are compatible in terms of transmission characteristics, viewers/buyers will be extolled to procure equipment which can receive **all** of the satellites operating. The widely reported $500 price tag is for a very simple system **not including** any hardware designed to move the dish through the sky from point to point.

UNDOUBTEDLY many early buyers will go for the cheap hardware just to get operational; but within a short period of time after 12 GHz service begins, viewer options for hardware should multiply rapidly. Motor driven dish systems, with and without pre-programmed orbit position resting spots, will be early 'step-up' package offered. Next problem encountered will be potential lack of compatibility between video and audio formats of the many services planning to launch; at 4 GHz, virtually all North American services employ **same**, standardized video and audio transmission formats. At 12 GHz, several applicants are planning systems unique to their own operation. Video bandwidths, method of transmitting audio, and security (scrambling) approaches will vary widely unless there is pre-agreement to adopt standards prior to service launches. At moment that appears unlikely.

CONSUMER then may will be faced with bewildering array of choices; which format to buy, what size dish and what type of mount. Since viewer-numbers is name of game at 12 GHz, just like it is with terrestrial broadcast services, there will be intense publicity and promotion by each of the services.

BALANCE of 80's can be characterized as 'fall-out' period for 12 GHz DBS, with no clear patterns evolving much more before 1990. 4 GHz service, meanwhile, established and growing each month, will continue to have strong consumer appeal and sales run. **After 1990,** strong 12 GHz service patterns will eventually take hold and service will mushroom into a large international service.

RECORD amount of Intelsat traffic during May, June and July has Intelsat and Comsat pleased. World Cup Soccer, Wimbledon, Falklands, President Reagan visit to Europe and other 'unusual' interna-

It's raining cats and dogs, and the dish needs moving.

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tional activities more than doubled number of 'transmission hours' for video programming for month of June alone.

WESTAR 5 at 123 west going into regular service as you read this. It will be several weeks before full impact of new Western Union bird can be assessed since satellite will carry both move-over services from W4 and several new users (see **CSD** for July). After surprise showing from W4, in northern reaches of South America and eastern Caribbean, field measurements of W5 are eagerly anticipated by these television-starved areas.

WESTAR 4 traffic patterns, meanwhile, will become increasingly oriented towards non-cable video. SPN (TR22) is largest cable-oriented programmer that is NOT making switch to W5. SPN decided against W5 move because it is customer for Hughes Galaxy bird scheduled for mid 1983 operation, and move to W5 would have lowered its 'status' on satellite should there be a failure of a transponder. WU plans to shut down W3 as a video bird, perhaps as early as this September, moving network and special feeds (Entertainment Tonight, Saturday Night, others) to W4. **CSD** will look at how it all sifts out in October issue.

NEW YORK CITY planning to build $100M plus space communications center where 38 acre site will hold up to 20 transmit and receive dish terminal systems.

FCC apparently has thrown in the towel on regulating satellite owners. Commission has been faced with decisions relating to how to handle the many different approaches to satellite system ownership. Hughes started ball rolling by offering transponders for sale; followed by RCA and then Western Union. FCC wrestled with whether existing rules allow satellite owner to sell individual transponder systems while retaining ownership of satellite superstructure (fueling, navigation, powering) portions. Decision considered good news for satellite owners since it clears way for them to recoup substantial portion of their investment before birds are built and launched.

NEXT problem caused by decision is insurance. Presently, satellite owners carry insurance for whole bird and pay premiums designed to cover insured peformance for design life of bird. With transponders sold or leased or rented, problems mulitply. Individual transponder owners will have to obtain their own insurance to protect them against losses should their individual transponder (s) fail prior to normal 7 (to 10) year design life.

ADDITIONAL problem created is transponder back-up capacity provided to transponder users by satellite operator. Galaxy, for example, is retaining 6 of 24 transponders for 'service restoration' should any of transponders fail prior to 'guaranteed' seven year lifetime. During period when all transponders are operational, Galaxy may rent some or all of these 6 transponders for a 'pre-emptible' tariff, but any firm using one of these 'extra' transponders will be faced with sudden eviction should one of the 18 'primary' transponders fail.

ANOTHER firm planning to offer customized package of sports, movies, indie programming and news plans debut in October. Telstar (not related to AT&T) will charge up to $8 per month, per room, to hotels taking service which will be transmitted on Comstar D3, transponder 21. TravelHost Magazine, available at many Sheraton, Howard Johnson and Day's Inn operations, plans to carry daily satellite TV log. Telstar will provide turnkey service consisting of equipment package design, installation, and maintenance. Telstar will expand to second channel in first quarter of 1983.

SPECULATION that US may end up with too few 12 GHz orbit assignments to accomodate the rush to DBS has planners preparing for 1983 western hemisphere conference concerned. With clever cross polarization and 26 MHz wide channel assignments, there may be as many as 36 satellite channels available per orbit slot. And at the moment it appears US may end up with no more than four DBS orbit spots; one, ostensibly, per time zone. As practical matter, mountain time zone had high need for DBS service because of spread of largely rural population, but traditional (i.e. 'terrestrial TV') history of taking Pacific time zone feeds on hour-later basis. Central time zone has long taken eastern feeds at 'hour earlier' basis thereby reducing to two the number of actual feeds, for most programs, for full CONUS coverage.

NETCOM International, the teleconferencing firm, has a new telephone number and address; 1702 Union Street, San Francisco, Ca. 94123 (415/921-1441).

FORMAL acceptance of Nicaragua into Soviet Intersputnik system has been announced. New, 12 meter, terminal is scheduled to be operational by middle of 1983 and will link through Ghorizont system with Cuba and eastern block nations.

HARRIS Corporation has announced sale of approximately 140 of their semi-controversial 'Delta-Gain' 3 meter terminal systems. Bulk of units are going to 120 station Sheridan Broadcasting Network radio service which is shifting its present network to satelite from terrestrial inter-connection.

LAUNCH dates for future ANIK birds: ANIK D (number 1, a 24 channel C band bird) this month (August 12th scheduled); ANIK C (first of three), 12 GHz bird, November 11th of this fall, followed by a pair more (Cs) on April 20, 1983 and April 18, 1984. Second ANIK D scheduled for October 10, 1985. The first ANIK D is going out via Delta rocket; the balance via 'Shuttle'.

STC (Comsat's DBS affiliate) has asked the designers of integrated circuits to develop an IC which will allow DBS subscribers to be 'addressed' individually, for up to three channels of DBS video programming. STC had originally intended to develop the device 'in house' as a hedge on protecting the security of the system. They may still do manufacture of total decoder 'in house' although key to unit will be IC designed for addressing purpose.

ARGO Communications has FCC blessing to lease six transponders to ANIK D bird for voice and data network. Argo will pay Canada's TeleSat $112,600 per month for each of the six trandponders through the end of 1984, after which Argo is expected to switch new network to a US bird. The $112,600 rate is roughly equal to amount paid by F4 transponder buyers amortized over a 7 year satellite life ($10,912,00).

ABC decided against launching of 'SupeRadio' network concept which was to have been distributed via satellite. Fewer than ten stations had signed up for service.

NBC is using 6.2 MHz sub-carrier on TR6,F1 to distribute 'The Source', a new NBC satellite delivered radio network service. Service will be fed via satellite in analog mode until late 1983, and then switch to digital modulation format.

FINAL decisions to bring together Canada and USA on political

reality of cross-using each other's domestic satellites all but completed. However, **don't** expect Canadians to authorize direct individual cable system reception of US services except under very well defined circumstances.

ONE indication of how FCC is leaning with proposed 2 degree satellite to satellite spacing proposal now floating is found in reports that US and Canada have decided to respect a 3 degree satellite to satellite spacing. Canada reportedly has agreed to tighten its own orbit belt region for 3 degree spacing and there are indications now that this is direction FCC is leaning also. FCC proposed 2 degree spacing, caught alot of flack for proposal, and now it appears may adopt 3 degree spacing at least at C band (4 GHz) as an accomodation for the 1980s and into the 1990s.

HBO is building new Satellite Communications Center near Haupage, New York. Facility will have quad set of 11 meter SA uplink terminals.

NEXT Rick Schneringer STTI conference/seminar for the industry is set for last days of October in Atlanta, Georgia. Seminar will feature three days of intensive lectures, more than 100 exhibits of state of the art TVRO equipment. Full details for registration and exhibiting available from STTI at P.O. Box G, Arcadia, Ok. 73007 (405/396-2574).

DON KING's DKSEN (Satellite Entertainment Network) can be reached at 212-794-2900 and they are anxious to have licensed downlink affiliates increasing their 'gate' at boxing and entertainment events in the months ahead. If you have a mobile downlink terminal, can contract with a legitimate point of display (night club, meeting hall, etc.) to carry event, DKSEN wants to talk with you about arrangements to make you a part of their network.

(CONTINUED / from page 3)

a cable bird, make it available to the cable **execs** in an unscrambled mode (as done in June on F4), and then figure that no cable system is going to be dumb enough to stick the event on their cable system without getting King's permission. Which is another way of saying "without paying for it."

King is sharp, and his instinct is probably correct. If he follows this approach, and if there are not more than a few thousand illegal bars and clubs stealing his product in the unscrambled mode nationwide, he can probably live with the thefts, in return for getting into millions of additional (paying) cable homes. He is a good 'promoter' and the cable systems liked to be promoted in this show-bizzy fashion.

SPEAKING OF SCRAMBLING

It is worth noting that one of the handicaps to working out your own anti-scrambling device is a lack of scrambled signals in the air, full-time. Well, over at 114 west we now have a pair of 24 hour per day scrambled video services operating and you can study them at your leisure and design your own anti-scrambling (AS) hardware. The system in use here was also employed on several of the **non F4 feeds** of the Holmes/Cooney fight, and it is a 'brand name' package. Chances are you will find many opportunities to use any AS hardware you may put together.

For those who are not sure where to start, we suggest that you feed the video output from your TVRO receiver into a communications receiver, and tune through the video passband starting down around 100 kHz and go up to 7.5 MHz or so. You will find a very fat (as in strong) carrier around 2.045 MHz and if you listen carefully you may hear some horizontal and vertical sync pulses laced in there. We suggest that you consider the possibility of building a stage or two of video amplification, peaked at the 2 + + MHz frequency you will find vertical and horizontal sync pulses present. They, now, could be coupled to drive your monitor or added back into the baseband video information.

You will also find another carrier just above 7 MHz. It will prove easier to dicipher what it is doing, and how, by remembering that the Canadian system is 'addressable' and out there in the field the individual descrambler boxes can be told when to allow clean video and audio through, and when to revert back to a scrambled mode. It takes a 'command' to get the converters into and out of a controlled situation, and that intelligence has to be transmitted someway, someplace. Uh huh. You'll figure it out.

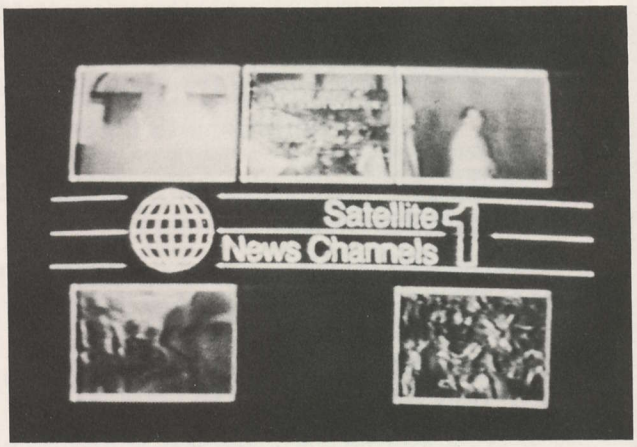
SNC SPELLS SNICK?

With only a modest amount of flubbing the ABC/Westinghouse Satellite News Channels operation came up on schedule mid-day on June 21st. The world on Westar 4 suddenly changed, and with all of the SNC related traffic destined to move over to Westar 5 (perhaps even before you read this), Westar 5 will have a unique, SNC-look and character from the outset.

SNC began life by feeding their national service out on horizontal transponder 11. There, 24 hours a day, are CNN-like news people grinding out the top news stories of the hour and day. Over, and over, and over again. It has a distinct CNN-2 type look with the most obvious change being that ABC and Westinghouse have apparently leaned on some corporate sponsors to be advertisers early on.

But after the national channel service, any relationship to CNN or CNN-2 ends. During a normal hour you can find (on W4; again, due to change on W5) regional news feeds for 5 minutes a pop on transponders 8, 14, and 18; plus national inward bound material (largely Washington DC) on TR 16. The regional news inserts may be the one thing that gives SNC a Chinaman's chance of pushing Ted Turner at all. Once you get the sequencing figured out (see report in Transponder Watch, next issue) it becomes apparent that having direct satellite access to the regional (and even local) news for Bozeman and Anaheim and Charleston could be a very saleable product. But I think that perhaps SNC is missing a great opportunity with these regional feeds.

The way it works is this. The cable affiliate has a pair of receivers; one is parked on the national service and there it stays for most of the hour. The other is parked on the regional feed transponder for his area. Once per hour, on cue, the national service drops off the cable system and replacing it is the regional feed service. This lasts five minutes. In that five minutes cable viewers in the Pacific Northwest, for example, get a five minute news summary from Fisher Satellite Ser-



We've got something for everyone.

It's all here – just what you've been looking for!

10:30 A.M.

11:30M 12:30C 1:30E 2:30A

02 [F3] – Good News America
03 [F3] – INN News
07 [F4] – Transformed
07 [F3] – ESPN's SportsTalk Special: 1982 NFL Draft
09 [W4] – Club de la Television
10 [W4] – Business Analysis
11 [AB] – Mr. Dressup
15 [F3] – News Update
15 [AB] – Femme D'Aujourd Hui
16 [F3] – Tomorrow's Families
17 [F3] – Pitfall
17 [F4] – Jimmy Swaggart
19 [AB] – Regional Program
19 [A2/3] – Just Like Mom
20 [F3] – MOVIE: 'The Late Show' A lady coaxes a crusty private eye out of retirement to find her cat and together they unravel blackmail, mystery and murder. Lily Tomlin, Art Carney, Bill Macy. 1977.
22 [W4] – Susan Noon Show
24 [F3] – MOVIE: 'The Big Red One' A combat veteran leads his batallion of young soldiers into toughening battle. Lee Marvin, Mark Hamill, Robert Carradine. 1980. Rated PG.
03 [F1] - CBS News
23 [F2] - NBC News (Dual A)
21 [W4] - Matinee at the Bijou "Cowboy Commodores"

11:00 A.M.

12:00M 1:00C 2:00E 3:00A

01 [A2/3] – Definition
02 [F3] – Good News
03 [F3] – Dick Van Dyke
06 [W4] – Caras y Gestos
07 [F4] – The King Is Coming
07 [A2/3] – One Life to Live
08 [F3] – It's a Great Idea
09 [F3] – Coronation Street
09 [W4] – Catedras Universitarias
10 [W4] – Nyse, Amex Update
11 [AB] – Sesame Street
11 [F2] – Sky...Blue?
12 [F3] – MOVIE: 'I'll Cry Tomorrow' This autobiographical story of Lillian Roth chronicles her decline into alcoholism and her slow journey back to health. Susan Hayward, Richard Conte, Eddie Albert. 1956.
15 [F3] – News Update
16 [F3] – Growing Years
17 [F3] – Bull's Eye
17 [F4] – Our Jewish Roots
19 [AB] – Wok with Yan
19 [A2/3] – Mighty Hercules
22 [F3] – Pertinent Magazine
22 [W4] – Sew Video
03 [F1] - CBS NBA Basketball Playoff (2½ hrs.)
17 [W4] - Big Blue Marble
21 [W4] - Market to Market
23 [F2] - Smurfs
15 [W4] - Last Chance Garage

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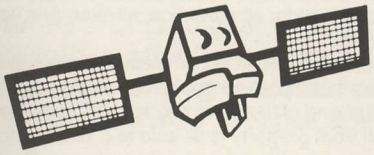

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vice. Then the machinery re-cycles and the cable viewer is returned to the national service.

That's neat for people who live in the Northwest (or whichever of the 24 national regions). They get the best of both worlds that way. But it seems a shame to spend 5 minutes of valuable transponder time to tell just the people in a particular region what their latest regional news is. It is a double shame when you consider that we live in a highly mobile country with something like 21% of the population moving residence each year.

SNC ought to consider packaging the 24 regional five minute newscasts into a pair of additional cable service channels. Twelve of these five minute newscasts equal an hour, and they repeat each hour. That way people who move to Florida (or go there in the winter) could take at least five minutes of 'hometown news' with them per hour, no matter where they go. It is sort of like having the hometown newspaper sent to you after you move.

The SNC and CNN and CNN-2 (and network) newscasts all pretty much cover the same national and international news. If you watch any one of these, you have as much of that news category as you need. SNC does, however, have a sleeper 'second level' product in their regional newscasts. Here's hoping they realize this, and work out some way to allow individual CATV, MATV and SMATV systems to take and use that service as suits the needs of the local audience.

TOM HUMPHRIES AND I

I first met Tom Humphries on a cold, January day in 1977. He was working as marketing manager for a firm called Scientific Communications, Inc. (SCI), and he had traveled to Afton, Oklahoma to witness the 'turn-on' of a proto-type six meter all steel dish designed and constructed by a chap named Stormy Weathers, with the help of another fellow named Tony Bickel.

Weathers and family owned a firm called United States Tower Company (USTC), and they had been building big (as in 800 feet tall, 50 inch on a face) CATV towers for years, along with a line of heavy duty CATV log receiving antennas, and, UHF parabolic dishes up to 20 feet in diameter. They got into the antenna business when a former employee of mine at CADCO, Tony Bickel, had moved into their part of Oklahoma. Bickel designed similar antennas for me at CADCO.

It was on December 15, 1976 that the FCC had approved use of cable TVRO antennas 'smaller than' 9 meters in diameter. You see, prior to that FCC action, the only cable TVRO antennas that would be licensed were those that were at least 9 meters in size. And in those days if you did not have a license for a TVRO antenna, you couldn't operate the antenna. Not in conjunction with a cable system, anyhow.

Bickel and USTC wanted to be the first to have a six meter size antenna on the market. They figured the $52,000 and up 9 meter jobs could be trimmed down to under $25,000 (that's antenna cost **alone!**) quite easily. ADM's 6 meter dish was not even a glint in Jamie's eye in those days, so the under $6,000 price tag now available was lunacy to consider.

Humphries and SCI were new in the Low Noise Amplifier game, for the cable market. They were hoping, along with USTC, that the FCC ruling would 'open up' the cable market. In the first year of cable use of satellites, fewer than 75 nine meter and up TVROs had been licensed. It turned out both USTC and SCI were right; before another year had passed the FCC would be receiving more than 75 CATV terminal applications **per month**! So here was Tom Humphries, with a couple of proto-type 180 degree LNAs sitting around while a young engineer from Microdyne and another from TerraCom tried to hook up their respective $8,000 TVRO receivers to the unpainted Tony Bickel bronze and brass feed horn sitting in front of the bright, unpainted surface of the first USTC six meter dish.

We were all understandably excited when HBO and Ted Turner's WTCG popped out of the noise. None of us noticed that when Bickel went out to play with the feed after initial signal acquisition, he had moved the dish around to get a ladder under the feed; and the dish was now pointing directly into the sun. It took about three minutes for the unpainted 20 foot surface to collect, reflect and focus sufficient sun energy to heat, and then melt the 214 type cable that was suspended there. Bickel was undaunted. He used the melted coax as proof that he had designed a good reflecting surface. Weathers pointed at it as proof that he could build an accurate surface, and Humphries wondered whether his hand picked LNA had survived the heat!

Tom Humphries today is President of SPACE. He is also a veteran of the satellite TV revolution. I doubt very many others have seen as many terminal 'turn-ons' as Tom, in as many different places. From overseeing the installation of a five meter terminal atop a $12,000,000 villa deep along Mexico's western coast, to hundreds of CATV and industry 'parking lot' trade show quickie installations, he has been to and overseen them all.

Tom Humphries spent the last two weeks or so of June on Provo. He bunked in at our TV station annex, putted around the island in a small rented French built two cylinder vehicle, and made arrangements to acquire 2.2 acres here.

Long before I met Tom, in fact more than ten years ago, he had made a promise to himself that he clearly intended to keep. His commitment was that when he reached 45 years of age, regardless of where he might be in his business career in the states, he would stop what he was doing, clean up his stateside affairs, and pack it off to some island retreat where he intended to spend the rest of his life. Last summer he was down to visit us for ten days and I could tell he was seriously considering moving his time table ahead a few years.

"I love Provo; this is a really fine island" he would suggest over a cold beer. "But if a person was to wait another couple of years, it looks like most of this island's pioneering may be over. I want to get someplace where there are still opportunities to open a new business and be in on the ground floor development". This summer's visit was a bit of a shocker to Tom. The new 8,500 jet runway is nearing completion, new homes and condominiums and commercial buildings have recently been completed, or are under construction, all over. And land prices have continued to climb.

Tom is a water sports person. He is an accomplished Scuba diver. He, like the Coopers, figures that if you are going to live on an island, and you like water sports, it is kind of foolish to live 'in-land' away from the beach. However, beach front property is all sold and you are now dealing with second generation (or third, fourth, etc.) owners. Prices are naturally far higher than just three years ago when we bought on

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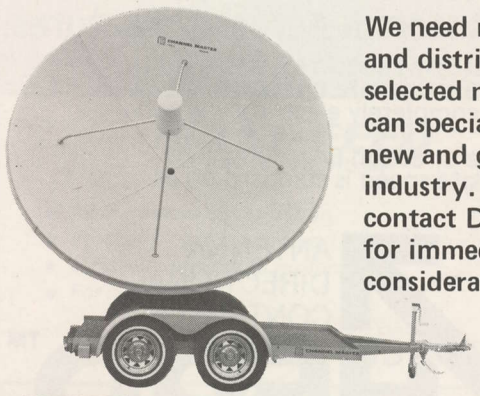

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SPACE Prexy Humphries preparing to board the Hegner 'Whisper Flight' on Provo. Tom left his scuba gear, cameras and most of his personal effects behind when he had to return to the states June 30th to tend to business. "I shall return . . . " **he noted. Probably before you see this.**

the beach.

As with most things in life, there is a time to think and a time to move. Tom figures the time to move is upon him. Accordingly, if he can make all of the pieces fit, he will be a full time resident of Provo by sometime this fall. That delights Susan and I since Tom has been a close friend for so many years. He plans to bring his home, 12 foot Prodelin terminal with him, pleased now to see that with the new service from F3R and W4 he can expect to have more than a dozen high quality channels of service available to him.

Tom is hardly the only 'satellite-person' to come here and decide this is his island. David Baker and wife Phan purchased property when they were here last spring, and it turns out that David and Tom may be quite close neighbors; both having zeroed in on the same section of island. Others in our industry have been down and are dickering with property owners for their own piece of coral and sand. We may end up with quite a satellite community here before we are done!

SATELLITE RETREAT

Back in May I suggested, with tongue in cheek (some will suggest my tongue was elsewhere), that we might put together a one week **Satellite Retreat** here on Providenciales. The loosely thought out concept was that for perhaps 30 people or so, we would give you five days of our time if you came down to the islands. There would be no booths (i.e. equipment displays), no sales pitches and keeping with island life a flexible daily schedule. I knew I could round up a couple of really top notch industry leaders, people you can't normally get a hour or two with privately, and between one on one sessions with these leaders and some free wheeling open discussions of the industry, the systems we have developed and the future we foresee coming, I felt that we could probably make it very worthwhile for attendees to flee the states for a week or so.

I was more than a little surprised to receive a dozen or more letters and perhaps twice as many telephone calls (at the Fort Lauderdale office) from people who wanted to know specifically how to sign up to attend. The May mention of the Retreat concept was not your traditional 'run-it-up-the-flagpole and see if it flies' manuever. We had no such devious thoughts behind us. It was clearly intended to be humorous, in the face of the rhubarb over shows in general.

Well, I guess we have put out foot into it again. Several people have told the **CSD** office in Fort Lauderdale that if we con't create an 'organized' Retreat, they are going to **drop down here** for a week, anyhow, this winter. Faced with the possibility that the coming winter will turn into a 'disorganized Retreat', all winter long, I believe it may be intelligent to try to cram all of these visits into a single week long period so that those who are bent on this craziness can cross pollinate one another.

So let's look at the logistics of pulling off a Satellite Retreat in the

Turks and Caicos Islands. There are two relevent problems attached to coming here; problems which magnify when the group starts to get 30 (or more) people large.

1) **Transportation** . . . normally when you decide to go someplace you pick up the telephone and make reservations. If you try to do this here, you will get as far as Fort Lauderdale/Miami and then you will be semi-stumped. We'll see why shortly.
2) **Lodging** . . . and, normally when you want to visit someplace, you call the facility or a toll free number and request reservations. This also will not work here.

There are two ways to get to Providenciales; you can fly, or you can take a boat. An ocean going boat requires three days minimum so we can rule that one out for most. There are no cruise ships or other ships coming down here which have food and sleeping accomodations anyhow. Provo is not on the typical Caribbean tourist run!

Flying. Now you have two choices again. You can fly Air Florida from Miami to Grand Turk (three days a week at the present time), and that takes about 80 minutes in a DC9. No question, that is the comfortable way to travel. **However,** Grand Turk is 70 miles east of Provo, and you'll spend more than two hours back tracking that 70 miles in a 12-16 seat 'Tri-Islander' aircraft that at best is uncomfortable. All told, with ground time on Grand Turk, you'll spend at least four hours getting from Miami to Provo this way, and you are limited to a single medium sized suitcase per person.

Or, you can fly directly from Fort Lauderdale to Provo. Right now, **today**, this is done with a Beech D or H-18 aircraft. They seat 8 or 9 people and it takes between 3 and 4 hours to make the trip. You can do

ONE WAY to get Bob Behar to visit you is to install one of his dish systems! Bob and the full family dropped into Provo early in July to help us put the finishing touches on the new automated Hero six meter. We thought about holding out for one of the new Hero 7.5 meter and then decided there is always next year!

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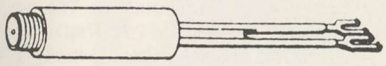

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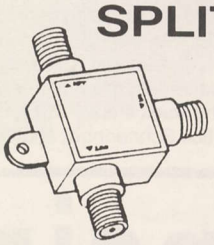

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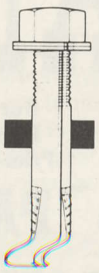

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this twice per week on a schedule; and some weeks they fly another flight or two. I am promised that by fall, mid-fall anyhow, there will be some slightly larger and considerably faster planes on this Fort Lauderdale to Provo run. All three of the firms that do this sort of thing are in an order-delivery cycle to put on 9 to 12 place aircraft that will make the trip in about two hours and 15 minutes or so. These Fort Lauderdale to Provo flights are run by what amounts to (FAA 135 certified) 'Charter' operators and that means that they can, given sufficient notice, graduate to larger, or faster, aircraft when the demand (and dollars) are there. One books 8 passenger Sabre Jet charters while another has a DC3 available. The DC3 is an old airplane, but it can haul 30 people or so plus alot of baggage and cargo. However, the DC3 requires three and one half hours to make the trip.

The present Fort Lauderdale/Provo services run pretty much full most of the time. There is no way we could drop 30 extra people on their schedules without creating havoc. Some careful, advance planning is a must.

The transportation problem aside (we'll look at rates shortly), that gets us to lodging. Although several new 20-40 room hotels are started, there are really only three facilities presently available. **The Island Princess** has 35 rooms open and is directly on a beautiful beach; barely a mile from WIV. They also have a couple of meeting rooms that we could use for the Retreat sessions. Life at the 'IP' is best described as 'informal'. There is no room service, no in-room telephones (or television) and the first thing you notice when you check-in is that there is no registration desk or office. Cal Piper runs it out of his back pocket.

The Erebus is built along a ridge overlooking a Marina. They have ten cottage type buildings which are 'rustic'. Each has a balcony facing the ocean and you have the illusion of being hundreds of feet above the sea. The nearest beach is about a ten minute walk.

The Third Turtle Inn is built around the marina which The Erebus overlooks. It is clearly the most fashionable of all, and the most expensive. They have perhaps a dozen rooms and cottages available this year, a tennis court, a beach that is five minute walk away, and docks and boats and tiny islands, all inter-connected with wooden causeways.

We are talking with all three about some **group** rates. The 'season' here normally starts around the first of December, and if we are smart we will get in ahead of the start of the tourist season. Waiting until after it starts will cause greatly increased costs and headaches to come into play.

What will it cost? Well, we will have the numbers figured out to the dime by the September issue. However, so you can evaluate how it might budget into your own funds, here is a **guideline** based upon current prices:

1) You get yourself to Fort Lauderdale.
2) From Fort Lauderdale, we will arrange air transportation. Figure on $130 per person, each way or $260 to and from Provo. If you want to chance the Air Florida jet to Grand Turk, plus the local island hopper back to Provo, the costs come out just about the same.
3) Lodging and food. This is the problematic area right now. We are trying to get it done for $50 a day a person, double occupancy. If the pre-tourist season looks too good to the hotel folks, we'll be lucky to manage it for $70 a day since they will be unwilling to commit to a lesser bulk rate knowing they can get the higher rate with drop-in business. If you are here five days, figure between $250 and $350 minimum per person.
4) Retreat Fee. If I am going to transport a couple of expensive people down here to make your visit here profitable for you, and there are only going to be 30 or so on hand, the cost for each attending to be a part of this will have to be in the $500 region.

All of this says for full Retreat attendees plan on spending $1,000 **plus** whatever it costs to get yourself to Fort Lauderdale. For those who want to bring additional family members, figure on $500 each (no Retreat fee).

If that doesn't scare you away, here is what you should do. The dates we are trying to work out are November 15-19 (14 to 20). That is the week ahead of Thanksgiving, and a couple of weeks after the next Rick Schneringer show in Atlanta. If you are REALLY serious about

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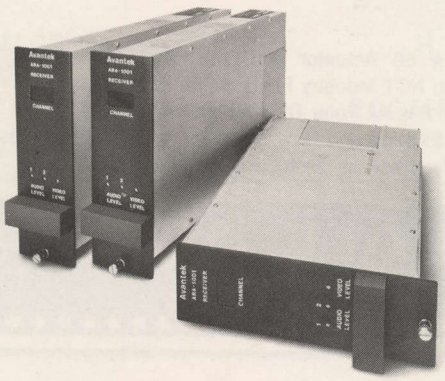

In all, these are just some examples of Avantek's continuing engineering program that builds customer benefits around sound product ideas. Avantek is a complete supplier of products for the CATV Industry providing state-of-the-art electronics for quality satellite TVRO and test equipment to maintain a quality system.

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attending, call Carole Graba at **CSD** in Fort Lauderdale (305-771-0505), or drop her a note (P.O. Box 100858, Fort Lauderdale, Fl. 33310). Tell her the following:

1) **Who** you are and how to get in touch with you.
2) **How many** people would be attending (this is very important since we have the dual, inflexible problems of adequate air transportation seating and lodging); **and** of that number, **how many will attend the Retreat sessions.**

You need to do this prior to August 25th. Don't tell me or Susan or anyone else; just Carole. Depending upon the response that we evaluate the last week in August, we'll announce a 'go' or a 'no-go' situation. **Then** we'll get back to you with a detailed set of instructions, and ask for a deposit from you.

One of the things you will have the opportunity to do, while here, is see how we have successfully integrated off-satellite direct feeds into a national television network. Our second channel of service here on Provo will be operational by November. We are calling it 'Channel X'. Our new broadcast center with a 200 foot transmitting tower should be operational on Provo, linked to the Grace Bay control center and studio and satellite complex by low cost point to point video relay. We have a new 10 watt VHF/UHF transmitter (with built-in modulator) package we are trying, which the supplier sells for $500. By working with suppliers since we started down here two years ago, we have been able to 'force' some dramatic pricing breakthroughs.

Our present antenna farm, a ten foot (SatFinder), five meter (AFC) and six meter (Hero), is being expanded and before you read this a new (second) Hero six meter is going in. An ADM six meter is planned prior to November. With the new Hero antenna dedicated to international satellites, driving some of the AVCOM special half transponder/switchable receivers, you will be able to play with the system and see what European, South American, African and Middle Eastern television looks like, and how it could be married to low cost VHF terrestrial transmitters to make the first-time television available to tens of thousands of communities world wide.

So if you are interested in attending, let us hear from you **prior to** August 25th. It could be a very educational and profitable week for you as well as a heck of a vacation for those who can afford to bring family members along. With the fantastic ocean beaches, snorkeling, scuba diving, wind surfing, sail boating, deep water fishing, and pioneer life style, we can guarantee you have never seen anything quite like Provo before!

ZEROING SOUTH

One of the pleasures associated with putting together **CSD** each month is being on the receiving end of newly discovered data relating to satellites. Inspite of our out of date telephone system down here in the Turks and Caicos, a few people manage to get through most days. Some fellows down in Haiti putting in a new SA 7 meter dish got through four times in one day recently; that was a modern day record.

When Bob Behar calls I always know that he has some exciting news about some new spot on the globe where he and another Hero six or five meter dish have found television. I envy what Bob is doing; bouncing around from continent to continent putting up big, modern terminals in Kuwait and Saudi Arabia and South Africa and Brasil. The Brasil experience especially intrigued me since it moved east, and south, the **known limits** of US Domsat service.

You may recall from a recent issue of **CSD** that Scientific Atlanta had a contract to install 33 of their 7.7 meter receive-only dishes for Brasil's Rede Globo television network. The terminals were to be installed by the start of the World Cup Soccer games; or prior to this past June 13th. For reasons I doubt SA even fully understands, not very many of the terminals got in on time. And a few of the Brasilian telecasters scheduled to get the terminals saw their viewers getting ready to march on the stations in something approaching armed revolt; should the stations fail to bring in the World Cup Soccer games on schedule.

I guess it was a little bit like the Santa Rosa, California cable television system back in the mid 70's. The cable TV system was pulling in a remote, Chico (Ca) station for cable distribution. 99% of the time it was just another CBS affiliate, and not a very good one at that. But for this particular Sunday it was carrying a locally blacked out Forty-Niner football game, and the local team was in the play-offs.

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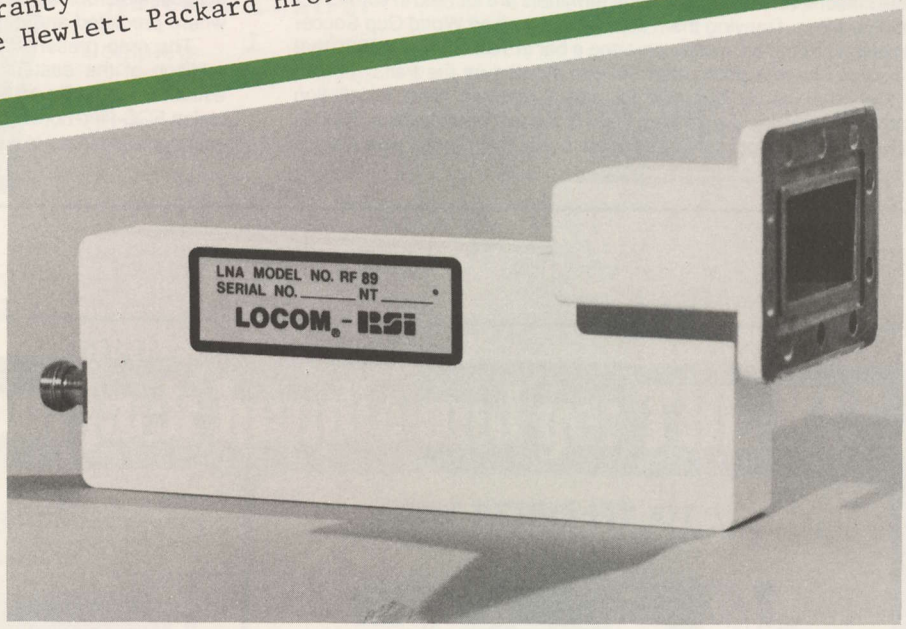

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Santa Rosa motels equipped with cable were booked up solid for weeks in advance. People came by the bus loads to have a football party. It was clearly an explosive-packed situation.

Along towards the middle of the fourth quarter the cable system's Chico equipment quit. When the picture tubes went dark in thousands of TV receivers around town the well juiced up fans stared in dis-belief. **Then they rioted.** Television sets were tossed by the score into motel swimming pools. Cars were overturned in the streets. The cable system office was beseiged, and suffered considerable structural damage. It took back up police from nearby towns, and the California Highway Patrol, to restore order.

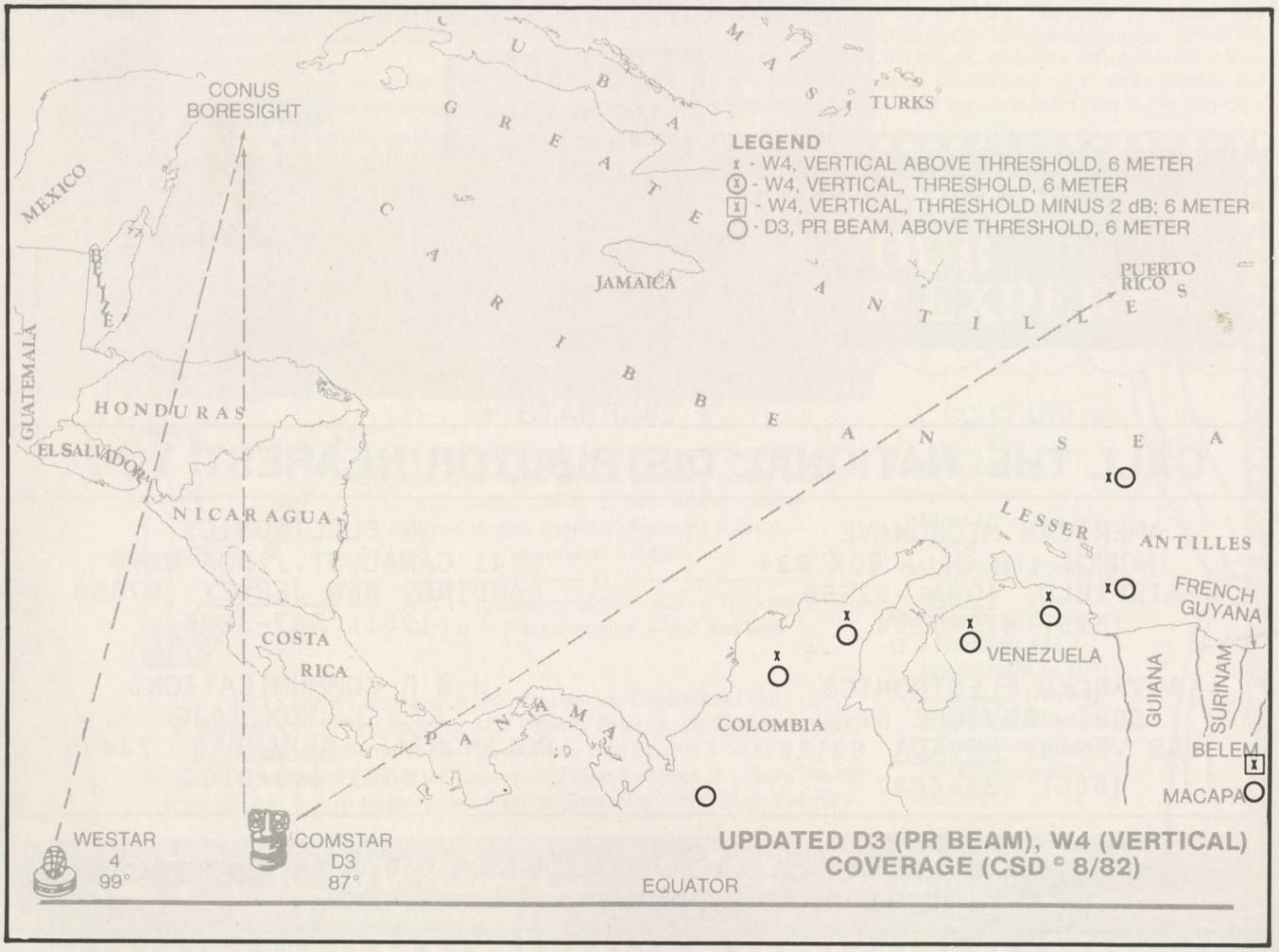
Fortunately for SA, few Brasilians had the price of a bus ticket to Atlanta, or there might have been a repeat performance of Santa Rosa. A couple of telecasters took the initiative, and the roughly $15,000 in US dollars that Rede Globo was scheduled to spend on their behalf for SA 7.7 meter terminals, and flew to the US. They went straight to Hero Communications, just minutes from the Miami airport where they loaded up on Hero six meter dishes, AVCOM receivers and 100 degree LNAs. They were headed back home, with the complete Hero terminals as "excess baggage" on Varig Airlines to rush the substitute terminals into operation prior to June 13th. A Brasilian soccer fan is one mean person when you cross him. And some of these stations scheduled to get the terminals are located in some very primitive areas. Denying them their long promised World Cup Soccer was akin to telling a Cowboy entering a bar in Tombstone in 1880 that he couldn't have a drink, after several months on the trail.

Well, the results are now in, and a talented Hero installation engineer who made the 20 hour flight to remote northeastern Brasil is back with the photographic evidence. If you want to tell your friends and neighbors who live in the region near Belem in Brasil that they can now tune in SIN or feeds to SNC or WOR (at the time on TR12 of W4) or SPN and Galavision . . . go right ahead. The vertical transponders on W4 are just a dB or so below threshold on a six meter dish equipped with an AVCOM receiver and a 100 degree LNA.

The significance of this is considerable. First of all, the Belem area is **south of** the Equator. In addition to being far-far to the east of the W4 99 west location (see map here), it is also back 'behind' the satellite and its antenna beam. And it was not the only US satellite seen there. Those in-use now and again COMSTAR D3 transponders, from 87 west, which are boresighted on San Juan (PR), or transponders 4, 8, 12, 16, 20 and 24, were a couple of dB **above** threshold at this location. And as our map shows here (see where the X and O and small squares fall), W4 is about as close to an international US DOMSAT bird as we have going for us at the moment.

With this kind of surprise and unpredicted performance, one has to wonder what is happening to the so-called 'sidelobes' spewing out of the W4 transmit antennas in the opposite direction; or, back towards the Pacific. The Hawaiian Islands, recall, are supposed to be getting signals on their own spot beam. Is it not possible, even probable, that vast areas of the Pacific are getting sprayed as well? We think so. Somebody on the west coast with a transportable Luly antenna, and suitable electronics, needs to spend a month or so touring the islands where predicted and unpredicted services is likely.

The map presentation here has many holes in it, but with the addition of the eastern Brasil data, we are at least beginning to establish the **limits of service** for W4. None of this fits the Western Union FCC-filed boresight map coverage, of course. And we checked with some sources to see why.



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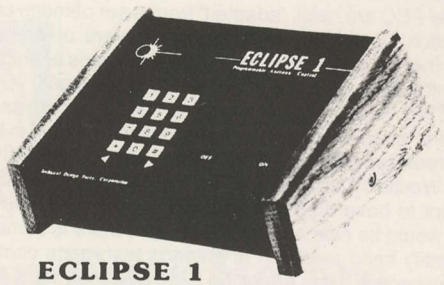

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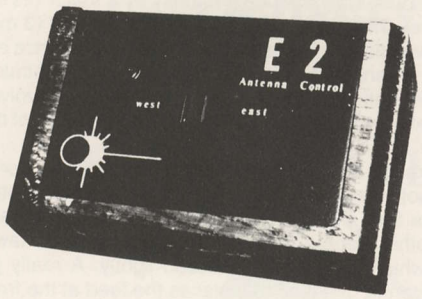

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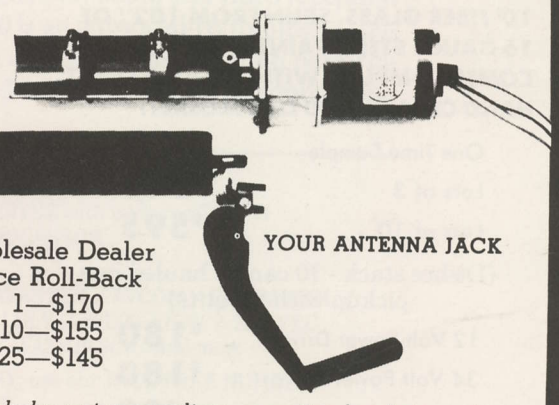

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What we found is a little disturbing. The maps Western Union filed with the FCC are, well, 'adapted' from a set of maps provided for our inspection. The maps provided to us were originated at Hughes, where the W4 bird was built. The Hughes maps are highly precise W4 transmit antenna patterns, down to the no-signal (O dBw) contour lines. They 'puddle' with splotches of coverage here and there. One of the 'here' locations settles over the locations shown in Brasil. **Hughes had predicted this** would be the case with **their** initial antenna range tests; Western Union, in making 'quickie' maps for their FCC filing, appears to have dropped out all of these 'splotches', so their FCC maps would be nice and clean. I'm sure there is some engineer who can justify hand selection of antenna test range contours to suit an FCC inspection. But I doubt the hand selection in the FCC filed maps was done by an engineer; I suspect it was done by a WU corporate attorney who prefered that the FCC not know about the broad, even expansive coverage of W4 (and now W5).

Having established, by checking the original Hughes antenna range test contours, that W4 could be expected to put **a signal** into eastern Brasil, I next checked on the signal **level** expected there. The 'splotch' fit over the Belem region, but alas the contour service level did not. Hughes had expected there might be 10 to 12 dBw signals there. The Behar/Hero results suggests the contours are closer to 22 - 24 dBw. Not quite enough for a high performance six meter to eliminate the sparklies, but still a very viewable picture.

The message here is clear. FCC filed maps are, at best, estimated projections of service contours. For not only domestic birds, but Intelsat birds as well. In the case of domestic birds, it is apparent that somebody goes through the process of 'cleaning up' the maps before they make those nice, pretty, FCC filed maps. In the publishing business, we call this process 'editing'. I doubt the FCC would be as charitable if the 'omitted' service levels happen at some point years from now to cause some foreign nation to park a bird over the equator and attempt to serve the opposite side of the equator from a location that is essentially the same as a US domsat bird looking 'north'. I'd hate to try to sit a bird at 99 west and cover Brasil with a boresight designed for that purpose. On paper, it would work. In the field, we now know that the Brasilian bird would have to fight W4 to get a useful picture into northern Brasil.

This report is not, however, a fault-finding exercise. I commend Western Union for making it possible for people in some pretty remote portions of South America to now have television; US television, at that. If I had a few weeks to spare, a couple of thousand extra bucks, and spoke fluent Spanish, I'd have my 12 foot Luly antenna and a good receiver and LNA into boxes so fast Susan would wonder where I was going. Then I'd spend sufficent time criss-crossing all along and north of the Equator in that portion of South America that does not border on the Caribbean. When I finally returned home, I'd have sufficient orders for six meter terminals to keep me busy for several years to come. And that's where the poineering **still is** in this business. Today, South America; tomorrow, the Pacific!

CASSY-ANTENNAS

There was an article appearing in the June 1982 issue of the 'educational portion' of **SatGuide** proclaiming the virtues of a new Cassegrain design antenna introduced recently by a major (as in big name) manufacturer. They basically said that their 10 foot (3 meter) antenna was so revolutionary in design that it had performance equal to other **4.5 meter** antennas. I would normally take such claims with less than a grain of salt. But, because of the company involved, I decided to see what new magic they have uncovered after all of these years.

Antenna black magic is real. The results (or lack of same) from the SPTS antenna shoot outs are evidence that some people are better at collecting electrons from the sky and focusing those electrons at a feed point; than other people. But there are some basic laws of physics involved which cannot be dismissed lightly. A really good prime focus fed antenna (the kind that places the feed at the front of the antenna, with the LNA and feed mounted out there in space) can achieve 55% efficiency. Anything better than that is probably measurement error. A ten foot surface, 55% efficient, equates to 39.5 dB gain, and anything claimed greater than that, for a prime focus antenna, is measurement error (⋆).

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A really good Cassegrain fed antenna (a Cassy antenna has a small metal disc where the feed is normally found, with a prime focus antenna; the disc collects the the signal that is focused on it from the main reflector surface, and then re-directs the energy back towards the center of the dish. This allows you to mount the real feed and LNA at the dish reflector surface, or behind it.) . . . can add 1.1 dB additional gain to that 55% efficiency. That says a really finely tuned Cassy 3 meter or ten foot antenna can have 39.5 plus 1.1 or 40.6 dB gain. That also works out to an efficiency of 78% for those taking notes. And anything greater than that is measurement error.

So along comes this Brand 'H' antenna that says they can achieve gains in the same realm as a 4.5 meter (15 foot) with a ten foot, because they have created a break through in antenna technology. Naturally I was curious about how they might do this.

The first thing that disturbed me was the way they got their material into print. It seems that they flew invited editorial writers to Florida to see their product. Years ago in the radio station business they called it payola when the jocks got booze or girls or albums or outright cash gifts in return for playing some promoter's records. Alan Freid, the famous jock whose life story later became a film, eventually died because people in places of authority discovered he was hyping certain record releases in return for payola. Getting a free airplane trip to Florida, being wined, dined and lodged by a company that wants you to write nice things about their revolutionary breakthrough in antenna technology would certainly put the editor in a tight spot. I mean, after you accept their hospitality, and you then discover that they want you to print a company written report on their antenna . . . what do you do? Fortunately I didn't have to make that decision since company 'H' wisely did not invite me to attend. I guess they knew before hand how I could be expected to react. I'm the guy that blew the whistle on RCA in 1978 when I found out they were having bad control problems with F2. Am I'm the same guy that blew the whistle on HBO getting cozy with Western Union in 1978 when HBO was trying to do an end run on RCA. I'm not easily influenced by corporate giants, which is possibly one reason why I live on an island.

Anyhow, so this highly tainted article is now in print and out there are hundreds of people who don't understand a blue dB and a red dB. You can tell the red ones from the blue ones only when you use a color cathode ray tube on a spectrum analyzer; just in case you are interested in such trivia. The red ones add signal and the blue ones take it away, but that is another story. And the same people who don't know the difference betweem red and blue dBs are now running about carrying the misconception that you can do amazing things with three meter antennas and actually get 4.5 meter performance from a surface only 66.66% as big as 4.5 meter aperture. Some of these people manufacture antennas, and they undoubtedly saw this tainted article and immediately ran to their own antenna experts to ask how they could get 4.5 meter performance out of their own 3 meter surfaces. I suspect that the first twenty antennas sold by company 'H' will have ended up in the hands of would-be-competitors who have by now carefully measured and cross measured every possible distance and angle and protrusion on the super-hot 3 meter company 'H' antenna. Probably in Omaha we'll see at least six competitive 3 meter surfaces that make the same claims that company 'H' made in their **SatGuide** (et al) article. Afterall, who could question the integrity of a company as big as 'H'?

Well, I did some more checking. Several things done by 'H' in their comparison of their ten footer against a non-specific 15 footer caught my eye. First of all, they claim their ten footer is very low noise. Noise or antenna temperature is not something we talk about very much in the home TVRO field. Possibly because nobody but Taylor Howard and Clyde Washburn and Tom Humphries even understand how it works. But the fact is that every antenna has a noise temperature, or factor, of its own. You can measure antenna noise just like you can measure LNA noise. However, antenna noise can change by simply

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*** — Inactual fact, there are those who have demonstrated up to 65% efficiency with a prime focus feed. Prodelin, Andrew are among those who have achieved this. Reasonable talent can achieve 55% efficiency and it has become the industry 'standard'. Exceptional talent, and holding you nose just right, can reach 65% efficiency; prime focus.**

pointing the antenna at a different part of the sky. If you stick the antenna down at a low look angle, for example, you will start to degrade the REAL antenna noise temperature by picking up earth or terrestrial noise. Remember the earth itself is a noise source; in the (just under) 300 degree (Kelvin) region. If you get the antenna to kick over and look squarely at the horizon, you'll end up with an antenna temperature close to 300 degrees.

Now I have been told, by a person who's facts are seldom screwed up, that the folks at 'H' saw fit to crank their comparison 4.5 meter antenna over to a 5 degree look angle to make their antenna noise measurements. Then they cranked their 3 meter super-hot antenna straight up, into the cold, black sky to make their own antenna noise measurements. That's like comparing the weather in Miami Beach with the weather in Nome, Alaska in the middle of January. Of course my friend could have had his facts screwed up on this particular part of how 'H' developed such amazing test comparison numbers, but I doubt it.

Then I'm told that they put a 120 degree LNA on the 4.5 meter comparison antenna, and a substantially better LNA on their own antenna. If that is true, here we are comparing Nome and Miami Beach again. I'd expect that kind of monkey business out of a guy in Iowa, but not somebody with a good reputation.

I could go on but I think you may be getting the picture. I hope the people who have bought this fantastic 3 meter replacement for 4.5 meter are getting a picture. If you throw away the hard core hype, the questionable measurement/hype techniques employed to make their product look good, and the freebee trips to Florida for the editors that published their 'pap', you will eventually come to the conclusion that 'H' is building a good surface. But I seriously doubt it is even 0.1 dB better than the best of those already on the market, and I hope somebody brings one to Omaha and the SPACE gathering so Mike Gustafson and Jack Trollman can run it through its paces. If 'H' has rewritten the laws of physics, and they are getting such amazing performance out the the red dBs and are somehow canceling the blue dBs in the process, I'll eat the colored CRT on somebody's spectrum analyzer.

LNA THEFT

Ok you guys. Whoever is responsible for the rash of LNA thefts nationwide has got to stop being such a dispicable person. Or persons, in case this is an organized ring.

Now several years ago when LNAs cost an arm and a leg, I could see where the mid-night LNA supply team might be tempted to charge about the country side putting cable headends out of operation by swiping their LNAs (and feeds as well since the two are usually bolted together). But come on fellows, with LNAs now priced so low that suppliers practically pay you to carry them off, what possible economic advantage can there be to getting up in the middle of the night, driving 50 miles to some farmer's cow pasture, and braving being gored by the biggest Brahma bull in the county, just to lift some cable or private terminal LNA??? It just doesn't make any sense!

I'll tell you what is going to happen to you if you keep this up. You are going to force people to take drastic steps to protect their hardware. Losing the LNA is not the problem; they are so cheap nobody minds shelling out $1.98 to replace them. But when you rip off some guy's LNA, you deprive him of the opportunity to see Monty Python chase the Holy Grail or watch Max Robinson drinking his fourth glass of tomato juice. And that hurts!

Now I understand that people are actually converting Prodelin and other 4.5 meter dishes from prime focus to Cassy feeds. Here they are getting Bob Luly to modify his feeds that normally go out with the Luly 12 foot Umbrella antennas, hacking holes in the center of 12 to 15 foot surfaces and shoving the Luly created 'cheapy-Cassegrain-feed' into the hole so they can stick the LNA in a locked box at the back of the dish. You are putting alot of people to very unproductive labor and if you keep it up this industry is going to lose man hours it cannot replace. And with Jack Valenti breathing down our back, we can't afford to mess around replacing LNAs and cutting holes in prime focus fed reflectors. We need to be putting in new dishes every day; not going out and repairing previously installed installations.

Keep this up and this industry will be in real trouble. You have been warned. Quit screwing up a good thing.

BAIT AND SWITCH

What follows will probably cost me a big advertiser. But enough is enough.

Last fall at Anaheim's SPTS gathering we saw Boman Industries first appear in public. They offered a number of hardware items, such as an antenna, an LNA and a receiver. All had one thing in common; a $399.50 price tag. I was not impressed with their antenna (which a representative admitted to me was an inferior product design which they would not repeat again after selling the initial lot of 100), and the LNA pricing in particular caused a ruckus. It turned out that, at the time of the November SPTS, Boman had no real delivery source worked out for LNAs. They were selling a product which they didn't have. The last word I had at the show was that they were 'thinking about' going to Korea to get LNAs manufactured. I couldn't think of any LNAs that had ever been manufactured in Korea. No slight on the Koreans; they just don't have that technology, yet.

Next Boman showed up at the Winter CES Show in Vegas. I didn't attend, but read a couple of trade press reports where a Boman person was quoted as saying that they expected to move 10,000 home terminals in 1982 (a reasonable number for a single firm). The same person quoted also said that Boman would be selling home TVRO systems via Sears and Roebuck. I did some checking on that one and got a "Boman Who???" response from Sears.

And then Boman asked to advertise in **CSD**. I said no. I felt the evidence was starting to suggest marketing techniques which certainly wouldn't do the industry any good. They could sell their 10,000 systems in 1982 without any assistance of **CSD**.

That was when the top Boman guy contacted me. He aked why I objected to their advertising, and I told him. He disclaimed any knowledge of the Sears quote, said that they 'hoped' to sell 10,000 home systems in 1982 and promised to modify their advertising so as to not mis-lead dealers. They did, but the modification made left something to be desired since it still suggested that you could go to them and purchase a **single** LNA, or **single** (complete) receiver or a **single** (complete) antenna for $399.50 each. I then requested that they redo the advertising copy to reflect the **complete** package price. They did this with their May issue advertisement; it told readers that for $1797.50 **(distributor price)** you would get a package of items. The advertisement told you what was included in the package. Then Boman changed their advertising layout for June (and July) and went back to a $399.50 ("Your Choice") headline with a 'Distributor Price' identification.

They had also worked out their LNA sourcing problem, and in March shipped down to me for evaluation one of their (120) units. It turned out to be an Avantek LNA and we'll tell you how it works in a couple of issues. Boman probably has had more to do with the latest (1982) round of LNA price drops than any other supplier, and since I am wedded to the concept of bringing pricing down on **quality**, home packages, I certainly cannot and do not fault them for that.

Now comes a letter and a few telephone calls. The letter is from a dealer who calls himself "Heaven Above Satellite Systems" and he operates our of Worcester, Massachusetts. Robert Leclerc runs their shop and part of what he wrote on June 16th to Boman Industries goes as follows:

"Bait and Switch used to be a term generally describing the practices of Sears & Roebuck. However, it seems your company has adopted this tactic in its latest series of advertisements.

"The enclosed copy of an ad which you placed in **Video Product News** (June 1982), and also the exact same ad in **Coop's Satellite Digest,** would lead me to believe that we are dealing with a reputable company.

"Yesterday when we called to order one of your SR-800 receivers, we were told by your sales person that you did not have any of these and they were made by an outside company. Also that he was not sure if or when you would get any more and that the unit was being replaced by the SR-800B at a cost of $599.50.

"We are interested in buying a unit so as to check its performance on our systems so that we might consider including it in our low cost TVRO packages in the future. The gentleman who spoke to us did not want to discuss the availability of the SR-800 and did not

seem to know very much about your business in general. We then switched subjects and asked for information on your polarity selector. He stated that he had never heard of such a unit and that it did not show on his literature.

"We are not sure of the total scope of Boman Industries but it does not bode well that your own employees do not know what it is you have for sale. We are also surprised that **Coop's Satellite Digest** would accept such an ad without checking on its creditability. If, in fact, the SR-800 receiver is now or will be available in the future at the stated $399.50 price, we would be interested in purchasing a single unit for test and evaluation".

On the surface, one gisgruntled dealer who asked for distributor (maximum discount) pricing for a single unit, and was refused, would hardly be cause to condemn Boman. A sales person, probably taking 8 to 10 calls per hour, hearing from a person who wanted to buy **one** of the least expensive receivers for the **maximum discount price** could also be pardoned for not showing greater salesmanship and enthusiasm. However, there have been other subtle and not so subtle signs of Boman's apparent corporate policy of skating on the thin ice.

At the most recent SPTS type show, in Fort Worth, Boman managed to decorate their out-front roadside trailer mounted antennas with more of the $399.50 "your choice" headlines. STTI's Rick Schneringer tried to get Boman to (1) move out of the front steps with their trailers, since they had (he said) not been assigned that spot, and, (2) take down the signs. Boman finally agreed to cover up the signs with large chunks of paper but we all know it rained and the wind blew in Fort Worth, and pretty soon the brown paper chunks tore off the signs below and once again the world saw the $399.50 pricing.

Schneringer wanted the signs covered up because he felt they were mis-leading. They didn't tell the would-be buyer that he had to buy big quantities to buy at that price, and in some cases the item with the sign was not the item being offered for the $399.50 (distributor price) amount. The matter of the big signs out front came up in a question and answer session I conducted at the close of the Fort Worth show; plainly, those who were dealers were very upset that the signs were out there in front of the show.

If one assumes that all of the hardware pieces for a complete ten foot terminal can now be collected for under $1800 (it can), and if one assumes that the installed price for such a terminal varies between $2995 and $4995, it is clear that there is more than a gentle mark-up possible. It is therefore no surprise to see some of the more intelligent buyers shopping for the best discounted prices they can find. It is one thing to drive across town to save $2 on a $10 purchase; and quite something else to save $2,000 on a $4,000 purchase.

I do not envy the defensive position that Boman and other suppliers find themselves in. Anybody can say anything on a telephone. Anybody can spend $10 to have some formal business stationary printed, and often that is all it takes to get a fat discount on a 'trial/evaluation' TVRO receiver (or LNA or antenna). I'd hate to try to hire a decent sales staff to cope with all of this. I'd hate to see myself having cut prices to the lowest possible level, cutting into profit margins so severely that I had to cut back on the 'quality' of sales people (by paying less than fair market value for help). Sooner or later, however, when you trim prices too much, you end up having to trim overhead as well. You also end up having to take units, that you perhaps 'mis-priced' initially, off the market.

I note that in the June and July issue of **CSD** the Boman advertisement still lists a 3300 model (3.3 meter) 4 section dish for $399.50. The mount is extra. I also note that they have introduced a 3000 series 'thermo-compressed' 8 piece, 3 meter antenna. The price on this one is $499.50; distributor level of course. All of this suggests that Boman may be paying a price for being the least expensive kid on the block.

Checking out the last nut and bolt on every product advertised in **CSD**, each month, and, checking out the fulltime integrity of every sales employee of every advertiser is of course impossible. I depend upon letters and telephone calls, like the one from Robert Leclerc cited. I also count on my own gut intuition which is backed up by having been in this business since before it was a business.

With any advertising, in any publication, there is a 'Caveat Emptor' creed. The buyer must not only 'beware', but he is also responsible for how he represents **himself** to the seller. I noted a couple of issues back that John Ramsey of Sat-Tec has tackled this problem head-on

by allowing a discount to a 'bonafide' dealer for a one piece purchase. It is not a big discount (far larger ones are available for quantity purchasing), but it recognizes that dealers do need to evaluate a new piece of equipment before they commit themselves to a quantity of units. I am not aware that Boman recognizes the same problem, with a solution. If they have already resolved this one, that's fine. If they have not, they should.

Boman comes into the TVRO world from the auto sound world. That happens to be a very competitive, dog-eat-dog selling environment, and I suppose that selling habits learned in that type of field are difficult to shake when you enter a new selling world. They are bound to ruffle a few feathers, and they are also likely to adapt their own selling techniques to those that are more in keeping with the traditions of home TVRO terminals as time goes on, and they stay in this industry.

The bottom line on all of this is that I wanted you to know that we continue to be responsive to reader problems with equipment suppliers, and that in the instance cited here we have been aware of some of the built-in-Boman-marketing problems from the outset. I don't want to deny them access to the industry marketplace by unilaterally deciding that they can't use **CSD** pages. By the same token, I don't want them 'using' the industry either. It is a difficult growth phase for all of the industry, and each of us should keep this in mind when buying or selling equipment.

NASTY STUFF

One day last fall, a friend of mine lost a pair of TVRO antennas. They were advanced prototype antennas approximately 7.5 meters in size. They had been built, under contract, to be shipped outside the United States to a destination where US domsat reception was the project goal.

The two antennas were shipped to a freight forwarding agent; a firm that has a reasonably good reputation for properly handling items entrusted to them. There, they disappeared. Naturally claims were filed, and my friend pulled out his remaining hair because these had been specially configured antennas for a special purpose. Recreating them, even with insurance loss money (if it came) was going to take a great deal of careful engineering time. You don't pop out a quality 7.5 meter antenna overnight.

Then one day the two antennas came back to the surface again. They acted, for the world, as if they had simply dropped into a crevice and disappeared from sight for a few months. They were intact, and apparently ready to resume their journey. In the interim, nobody could 'prove' where the missing antennas were, or where the fault was for their loss. My friend found himself fighting a losing battle with insurance companies who didn't want to pay off because the disappearence could not be substantiated. Had the antennas been knocked down by a fork lift and disintergrated, the claim would have been straight forward. Two very large antennas disappearing was another matter.

Initially my friend was pleased, even elated, to have his antennas back. His customer had moved on to another supplier in the interim, since like most customers, he needed his antennas 'yesterday'. But my friend was eventually able to find a couple of new buyers for the 7.5 meter antennas, and today they are providing excellent service at a location far outside of the CONUS area.

Then my friend began to hear rumblings about a new 7.5 meter antenna from another firm; one, it turned out, that had no real previous TVRO antenna experience. Getting from no experience to a 7.5 meter antenna that was capable of performing is no small step. That's like building a full scale Space Shuttle bird without ever building a mock up or model. So my friend, just a little suspicious as to how this new firm might have gotten into the antenna field without passing an engineering test, did some investigating. What he has turned up, and what I have turned up on my own (I, too, love a good mystery!) will one day make fascinating reading. Basically, it appears to both of us, each doing independent sleuthing, that while the two antennas were 'lost', somebody was painstakingly measuring every truss and strut and bolt hole on the antennas. One was apparently assembled, perhaps tested in the real world, and then disassembled. This was evident when the missing pair resurfaced one day.

If this conjecture holds up in court, it will be up to the court to decide

just how much damage should be assessed for industrial sabatoge. The crime, in this case, was the apparent bribing of a freight forwarding company employee who was talked into 'losing' a pair of 3500 pound, 25 foot reflectors and support hardware. And then borrowing the product long enough for the antennas (or at least one of the antennas) to be carefully measured and copied. All of this becomes evident when one compares the product of a new firm selling in the field with the original 7.5 meter advanced prototypes which disappeared for 90 days or so. And if that was not sufficient ('circumstancial') evidence, there is a trail of sloppy paperwork the 'borrowers' left behind as they moved the missing antenna (s) from point to point during their 90 day "antenna-napping".

I know. People steal things, ideas in particular, every day. Most of those who engage in this type of 'white collar' crime get away scott free since this type of thievery is either impossible to prove or the firm that experiences the theft is in an awkard position of fearing adverse publicity. So usually even those who are caught get off without being prosecuted.

And I am not so sure that this case will wind up any differently. In fact, I fear that those who lifted the design of my friend's hard-won 7.5 meter antenna knowledge will probably get away scott free since they make their base of operations outside of the USA, and it might be difficult (or impossible) to get their local jurisdiction to prosecute them.

Still, it grieves me to see someone like my friend get stuck in this manner. My friend is a craftsman with great pride in his products. He has paid his dues to this industry, and while he won't get many high marks for his business ability, he will always get my vote for honesty and superb engineering common sense.

And so I would like to put those who perpetrated this act on notice. At least one of you appears on our **CSD** subscription list. I hope you are perspiring just a tad at this point wondering if Coop is about to spell your name on the next line.

I am tempted. Very, very tempted. But no, I have a better idea.

It would do my heart good to have you, 'without pressure' and 'by your own freewill and honor', pick up the telephone and call my friend. Then it would do my heart even more good to have you tell my friend that you really feel terrible about what you did and that you would like to make amends. My friend knows who you are, as do I, and he won't be too shocked to hear from you.

I'll leave up to you, the person who's name I won't spell out on this next line, **this month**, and my friend, to work it all out. I'm sure you would rather do that than to see your name appear on 'the next line' . . . . . in a future month's **CSD.**

THE WOR SHIFT

The person responsible for orchestrating the WOR shift from F3R, TR17 to W4, TR12, gets my nomination for managing the sales program over on RCA's F4. Inept. Really, badly, inept.

First there was the confusion over when WOR would be moving. Keep in mind that WOR is one of those 'reluctant' super stations; like WGN. They have no legal control over their signal once it leaves the World Trade Center Towers in downtown NYC. Eastern Microwave is the Common Carrier, licensed by the FCC, to lift the WOR signal out of the public airwaves and spirit it about the USA via terrestrial microwave, and satellite. Eastern Microwave is one of those cable industry firms that makes its dollars by carrying to cable systems signals which the cable system cannot receive, directly, with an antenna hung on a tower just outside of town.

It is Eastern that tagged WOR as "The Nation's Station". It is Eastern that makes the ten cents (or less) per cable subscriber when WOR gets into a new home, via satellite or terrestrial microwave. It is Eastern that stood to lose, the most, if WOR cable carriage (via satellite feed) dropped from over 4,000,000 homes to around 1,000,000 after the F3R to W4 shift. I'd hate to be in charge of deciding which overhead to trim when my satellite monthly gross dropped from over $400,000 to around $100,000 in a split second.

So here is Eastern telling the cable universe 'not to panic' and ' not to lose the faith', and, **'not to drop WOR'** in Eastern cable trade press advertising, the week before the big move. Here is Eastern telling everyone that the move would take place on the 30th of June, with the new Cable Health Network due to take over on the F3R transponder on July 1st.

And here is Eastern buying time on WOR, on June 27th and 28th,

telling viewers that WOR was **not** disappearing, 'only' changing satellites. And here is Eastern urging viewers who will miss WOR on their cable systems to contact their cable systems to urge them to 'continue carrying WOR'.

If the Eastern satellite cable affiliates were depending upon the announced, and trade press published, June 30th cut off date for WOR service on F3R, they must have been quite surprised when at 2PM ET on June 29th the RCA Vernon Valley uplink dropped the WOR feed during a station break and substituted a slide that probably confused the hell out of the average viewer. It said that WOR had been moved. I suspect Eastern pulled this 'early bail out' to get the attention of viewers, hoping that they would in turn bury the cable affiliates with questions about the loss of WOR.

That's a pretty dangerous ploy. I am reminded of one of the classic events of the television broadcasting business, back in the mid 1950's. A UHF television broadcast station, poineering UHF in New England, was losing money every minute it was on the air. It faced the circular problem of having poor programming, which attracted few viewers, having few viewers which attracted few or no advertisers, which in turn meant they had no money with which to buy better programming. To attract more viewers.

Having tried everything they could think of, and reduced to running 1932 movies in prime time (they also couldn't get a network affiliation), they finally reached a jumping off point. So they asked thenselves 'Is it possible that we are broadcasting to ourselves; that NOBODY is out there watching us???'. Having already decided that only an act of desperation would save the station, they started their prime time movie with an announcement:

"The first viewer to call the station will be awarded $100".

And they rolled the movie. The telephone did not ring. Thirty minutes went by, and the phone did not ring. They broke the movie again, and upped the ante:

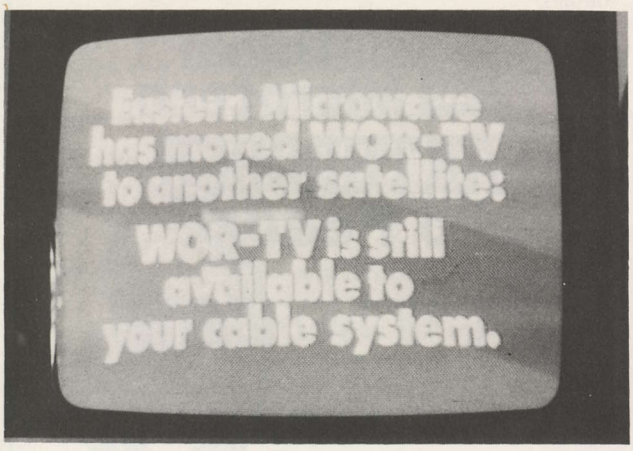
"The first viewer to call the station will be awarded $200".

Back to the movie. And no telephone.

They repeated this four times, finally reaching $1,000. Still, the telephone did not ring. They confirmed that the telephone was, indeed, working. Nobody, but nobody, was watching them. Nobody at all!

Whoever thought up the quick bail out campaign for Eastern, putting together some poorly created last minute commercials to air on WOR, and concocting the slide that replaced regular WOR programming at 2 PM ET on June 29th, faced the real possibility that he too was going to bomb. To be sure, people have, do, and will, watch WOR. But to expect viewers to **innundate** their local cable systems with complaints, especially after confusing the viewers with an explanation that only a satellite engineer would understand (something about not having primary contract rights on Satcom F3R and having to make a temporary move to Westar W4, after which they would move to Westar W5) showed extremely poor contact with reality.

Pity. I always liked WOR. For brief hours it even showed signs of



programming genius, every now and again. Eastern may have lost not only their time at bat but the whole ballgame with the way they handled the F3R to W4 move. I can just hear the little old Jewish lady in West Palm Beach calling her local cable system about a week after the move to ask the cable company representative what happened to **'Nine On New Jersey'**; a WOR mainstay for the folks around Hoboken.

"I'm sorry Mam, but WOR is no longer being transmitted on our 'cable satellite'" the cable lady will explain. "I know you miss your favorite New York program, and if WOR ever returns to our 'cable satellite', we will try to have it back on our cable system for you. But the company that transmitted WOR on satellite made the decision to leave the cable satellite, so you see there is nothing we can do here in Palm Beach . . . ".

Eastern lost sight of a basic marketing fact. You never insult the customer, and you never put the customer in a tight spot if you want to keep him as a customer. Eastern did both of these things, and the cable industry had to be insulted by such treatment. Again, pity. WOR will be missed.

ATLANTA/OCTOBER 29, 30, 31

The next Rick and Gloria Schneringer STTI gathering, or SPTS, is scheduled for Atlanta, Georgia on October 29, 30 and 31. This will be the first visit to the southeast for the traveling SPTS road show. Since Atlanta is the home of so much of the satellite innovation these days, it **could** afford an opportunity for SPTS delegates to visit some of the hallmarks of the satellite world.

At this writing the Omaha SPACE gathering is still weeks away, and the turn out and success 'marks' for this 'first trade association show' have yet to be assessed. Working against the SPACE show, however, has been the lack of a show-dedicated organizer (having a committee prepare for a show is a great idea, but when the committee is spread all over the continent, this makes fine tuning of important details difficult), and, the fact that early August may not be an opportune time for the industry to meet.

If there is a hump in the industry selling season, that hump comes between now and the middle of October. Anyone attending a trade show in that period of time loses several days minimum, and it could be a week or ten days. Losing that much time from selling and installing may be more than a new dealer can stand. I know if my sales were just starting to move, I'd have a hard time making an intelligent decision.

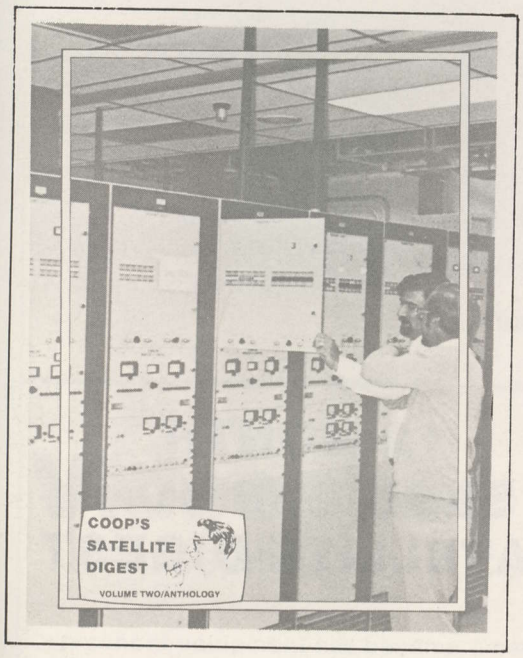
The 'program' for the Atlanta SPTS is just now starting to shape up and I expect there will be some 'hard announcements' as to the content immediately following the SPACE show. Schneringer is, I feel, bending over backwards not to step on the toes of the SPACE gathering, nor to detract from the attention it is getting, by making any of his announcements prematurely. What I have heard tells me that the Atlanta location was a happy coincidence of serving the southeastern USA, plus putting it into a position where local, Atlanta based satellite industry talent would find it useful to drop by and participate in the program.

The time has come, I believe, when the programmers need to be taking a more direct interest in the hardware, the systems and even the viewers who make up the private, home terminal marketplace. They say, in the real estate market, that there are three factors influencing the value of a piece of property. 'Location', and, 'location', and . . . 'location'. So too are there three factors influencing the eventual decision of programmers that private home terminals (and SMATV terminals) deserve some recognition. Those factors are 'numbers', 'numbers', and 'numbers'. When there is a sufficient number of home terminals operating, when our 'universe' amounts to something significant and our viewers count for dollars to be earned (or lost), then programmers will begin to pay 'positive' attention to us. That day is on the horizon, in my view, and it can come none to soon.

The way that programmers 'court' the cable affiliates is just this side of immoral. They wine then and dine then and cut deals to entice the cable affiliates to carry their services. Big dollars are spent annually to woo the cable affiliates to carry certain programming services.

Rick Schneringer's Atlanta SPTS may be a perfect opportunity to present the programmers with our growth statistics and to start a dialogue between hardware sellers/installers and programming firms. It could be a very interesting few days and I for one look forward to seeing how it all develops.

THE 1,000 (plus) PAGE, 8 POUND HOME SATELLITE TERMINAL TEXTBOOK



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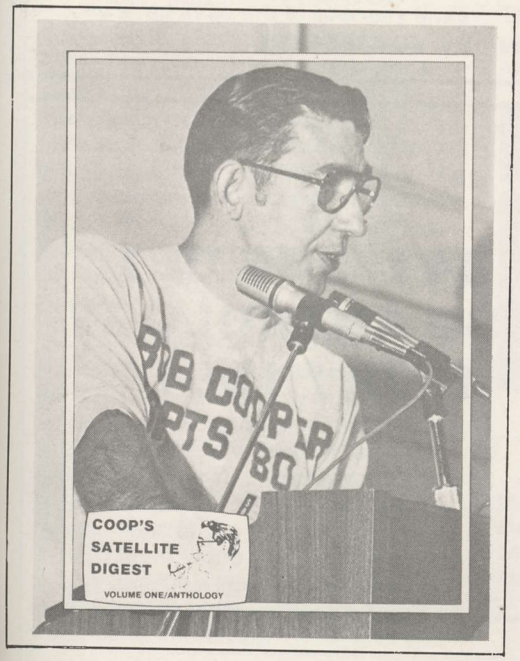

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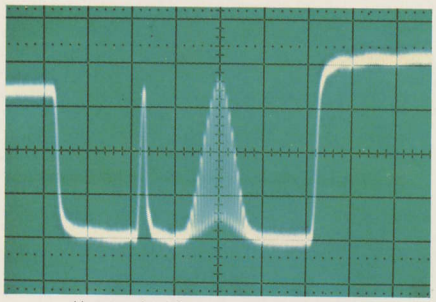

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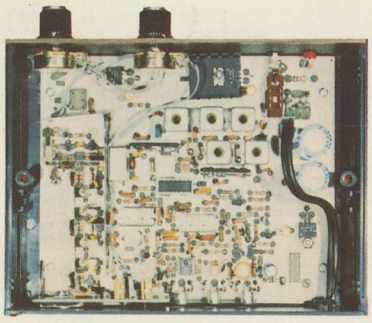

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